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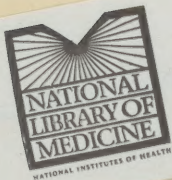


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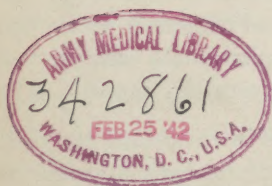
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INDUSTRIAL SURVEY OF THE STATE OF OHIO.

Evaluation of
Industrial Hygiene Problems
by
Ohio, Department of Health

ADULT HYGIENE DIVISION

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COLUMBUS, OHIO
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ACKNOWLEDGMENTS

Acknowledgment is herewith made to all persons, organizations and agencies who have, by their advice, cooperation, aid, and encouragement, assisted in the preparation of this study, including field work, analysis of data and publication of this report.

The Ohio Department of Health desires to express its appreciation to the Division of Industrial Hygiene of the U. S. Public Health Service for the assistance rendered and for copies of certain studies conducted by them in this State, which are included for analysis in this publication. Special acknowledgment is due Mr. J. J. Bloomfield, Sanitary Engineer, U. S. Public Health Service, and Mrs. Mary Peyton, Junior Chemist, for assistance rendered in the organization of the survey.

The Department wishes to acknowledge the assistance of the health commissioners of city and general health districts and their cooperation in this survey. Special acknowledgment is due the Cleveland City Department of Health for the personnel it provided to assist in actual field surveys.

The Ohio Department of Health is indebted to the Department of Industrial Relations for the lists of mines and especially to Mr. A. F. Reiher, Chief of the Division of Labor Statistics, who went to unusual lengths to insure a complete list of manufacturers; to the Actuarial Division of the Ohio Industrial Commission for the list of garages, and to the Office of the State Fire Marshal for the list of laundries and dry cleaning establishments.

Acknowledgement is made to the group of surveyors assigned to the field work in this survey for their effort and cooperation in the collection of the actual data from which this study is compiled.

Assistance of the Works Projects Administration in Ohio, Project No. 665-42-3-413 is acknowledged and that of the clerical personnel who aided in the preparation of a part of the copy and supplementary informative material which has been based upon the factual data in this report.

The cooperation of the surveyed establishments in furnishing the time and the personnel to assist the surveyors has been particularly appreciated for without this cooperation the publication would not have been possible.

Specific acknowledgment is also made to Walter H. Hartung, M.D., formerly Director of Health, under whose administration the industrial survey was conducted, and to Kenneth D. Smith, M.D., former chief of the Bureau of Occupational Diseases, the duties of which have been assumed by the Adult Hygiene Division.

FOREWORD

A survey of the public health situation in Ohio today and consideration of the twenty-year cycles that have marked public health developments since 1880 convey the impression that we are approaching a new era of public health.

In the past, a great deal of attention has been devoted to the problems of child life, and programs have been developed to benefit infants, pre-school and school children, only to see these same individuals subjected to the hazards of employment when they reached mature years.

Today, studies are being made of many problems of adult health including occupational diseases, and many hazards have been removed that have not only reduced the incidence of accidents but also the incidence of occupational diseases.

In accordance with the modern concept of public health and the offering of material assistance in health matters to adults in the solution of all their health problems, an Adult Hygiene Division has been created in a reorganization of the Ohio Department of Health. Industrial hygiene activities, including the administration of the occupational disease reporting law and the study of occupational diseases, logically fall within the scope of special health service to adults and are therefore directed by the Adult Hygiene Division.

This industrial survey is believed to be an important milestone in the progress of protecting the worker's health in Ohio. Limited expansion of the included data, which were collected on an adequate sample of Ohio industry, will serve as a guide to an evaluation of the problem and the establishment of a permanent industrial hygiene program by the Ohio Department of Health.

Essentially, the Industrial Survey of Ohio records the number of workers engaged in various occupations and lists the raw materials and by-products used or created in proximity to the worker. No attempt has been made to evaluate the degree of harmfulness or harmlessness of proximity to a material or by-product, and no attempt has been made to establish threshold limits below the concentration of which liability to injurious exposure may be presumed to be negligible. It is therefore evident that proximity of a material or by-product cannot be used as a criterion in the evaluation of an exposure in any industry listed herein. Only facts established by precise medical, chemical and engineering procedures can be used in reaching a conclusion regarding any given case.

Classification of materials into fifty groups as listed in the appendix of this report is arbitrary and has been selected for the sake of uniformity with similar undertakings in other localities as well as for the purpose of reducing the total number of materials listed. Extension of these classifications to include substances not herein mentioned can only be based on the plan followed in this work.

(Signed) R. H. MARKWITH, M.D.,
Director of Health.

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INTRODUCTION

THE environment wherein a person spends much of his life, be it in his home or workplace, must of necessity influence his physical and mental health. The study of the relationship of the workplace to the worker's health is not new. Bernardino Ramazzini, founder and patron saint of industrial medicine, as early as the seventeenth century investigated and reported upon almost every industrial process of that time and the diseases resulting therefrom.

Today, modern industry with its complexities and ramifications offers a multitude of hazards which, unless properly controlled, may adversely affect the health of the workers. Not only does industrial environment carry the hazards of accidents and specific occupational diseases; it also increases the incidence of other diseases such as tuberculosis, pneumonia, heart disease, and the degenerative conditions.

The 1930 census showed more than 49 million gainfully employed workers in the United States. Of these, 15 million were employed in the manufacturing, mechanical, and mineral industries where physical and chemical dangers constantly threaten the worker. According to that census there were more than two and a half million gainful workers in Ohio. Of these, almost a million were employed in occupations where potential health hazards are known to exist. Industrial hygiene, therefore, is a major health problem, particularly in Ohio which is one of the foremost industrial states.

The economic significance of Industrial Hygiene must not be overlooked. It has been stated that each wage earner in the manufacturing, mechanical, and mining industries represents the support of four persons. Thus at least one-half of the population of this country is directly affected from an economic viewpoint by the health of the workers in these industries.

Large industrial organizations realizing the importance of, and the benefit to be derived from an industrial hygiene program are economically able to offer this service to their employees. It has been proved that establishments of less than about 500 employes are usually not economically able to cope with industrial hygiene problems unassisted. More than sixty per cent of workers are employed in plants falling in this classification. Therefore, it is obvious that this important health function must become the duty of some official agency such as the state or local department of health.

In order to lay the foundation for an effective industrial hygiene program a knowledge must be obtained of the scope and nature of certain existing conditions such as general welfare provisions, exposures to specific materials by occupation and industry, and operating methods of control. Experience has shown that this knowledge can be obtained best by a preliminary survey of an adequate sample of industries. From the data acquired in the survey an estimate of the total number of workers exposed to specific materials and the occupations and industries wherein these exposures occur can be reached. This publication records and summarizes the data acquired in a survey of those industries in Ohio where actual or potential health hazards are known or suspected to exist. Other pertinent information intimately associated with the analysis of this survey and of importance in the evaluation of Ohio's Industrial Hygiene Problem is included.

THE PROGRESS OF INDUSTRIAL HYGIENE IN OHIO

HISTORICAL NOTES—LAWS—ACTIVITIES

The history of industrial hygiene activities in Ohio extends back more than half a century. The importance of maintaining the health of the workers in Ohio was recognized as early as 1886 when the First Annual Report of the Ohio State Board of Health announced that a standing Committee on Hygiene of Occupation and Railway Sanitation had been appointed by the president of the board. The chairman of this committee, Dr. John D. Jones, of Cincinnati, gave a report, "The Effect of Occupation Upon the Health of Individuals," which was subsequently published in the Second Annual Report of the Ohio State Board of Health (1887). It discussed dangers encountered by lead workers, barrel-fillers, file cutters, saw makers, tool makers, wool and cotton workers, and employes in gas works. This report also touched upon fresh air and light and showed by a table adopted from Dr. William Ogle of London, England, the mean annual death rate of males in various occupations. Subsequent annual reports were rendered by this committee for several years.

In 1910, the State Bureau of Vital Statistics published annual tables of occupation against causes of death. These tables were continued until 1914.

In 1912, the Industrial Commission was created and the administrative and executive functions of industrial hygiene were administered by the Department of Factory Inspection.

In 1913, the Legislature of the State of Ohio passed two bills of extreme importance to the progress of industrial hygiene. The first of these, House Joint Resolution No. 12, authorized and directed the State Board of Health to make an investigation of occupational diseases and industrial hygiene. A copy of this resolution follows:

(House Joint Resolution No. 12.)

Laws of Ohio, 1913, Vol. 103, p. 975.

JOINT RESOLUTION

Authorizing and directing the state board of health to make an investigation of occupational diseases.

WHEREAS, The employment of men and women in certain occupations is known to be attended with more than ordinary danger to health, giving rise to what is known as "occupational diseases", and

WHEREAS, Unnecessary sickness and shortening of life, from whatever cause, is a serious loss and of grave concern to the state and to all the people, and

WHEREAS, It is believed to be possible, by public education and by the enforcement of proper measures, to largely prevent unnecessary sickness and premature death among employes in various trades and occupations, therefore,

Be it resolved by the General Assembly of the State of Ohio, That the state board of health, is hereby authorized and directed to make a thorough investigation of the effect of occupations upon the health of those engaged therein with special reference to dust and dangerous chemical and gases, to insufficient ventilation and lighting, and to such other unhygienic conditions as in the opinion of said board may be specially injurious to health, and to report to the next general assembly the results of such investigation, with such recommendations for legislative or other remedial measures as it may deem proper and advisable.

Be it further resolved, That the finance committee of the House and the Senate be requested to place in the general appropriation bill an appropriation of \$7,000 for the year 1913 and \$7,000 for the year 1914 for carrying on the above work by the state board of health.

C. L. SWAIN,
Speaker of the House of Representatives.

HUGH L. NICHOLS,
President of the Senate.

Adopted February 13th, 1913.

In the same year, an act (O. L. V. 103, p. 184) was passed by the Legislature to require the reporting of certain occupational diseases to the State Board of Health by every physician in the State attending, or called upon to visit, a patient whom he believed to be suffering from occupational poisonings. This act was amended February 4, 1920, and follows in its present form:

Be it enacted by the General Assembly of the State of Ohio:

Sec. 1243-1. Every physician in this state attending on or called in to visit a patient whom he believes to be suffering from poisoning from lead, phosphorus, arsenic, brass, wood alcohol, mercury or their compounds, or from anthrax or from compressed air illness and such other occupational diseases and ailments as the state department of health shall require to be reported, shall within forty-eight hours from the time of first attending such patient send to the state commissioner of health a report stating:

- (a) Name, address and occupation of patient.
- (b) Name, address and business of employer.
- (c) Nature of disease.
- (d) Such other information as may be reasonably required by the state department of health.

The reports herein required shall be made on, or in conformity with, the standard schedule blanks hereinafter provided for. The mailing of the report, within the time required, in a stamped envelope addressed to the office of the state commissioner of health shall be a compliance with this section.

Sec. 1243-2. The state department of health shall prepare and furnish, free of cost, to the physicians included in the preceding section, standard

schedule blanks for the reports required under this act. The form and contents of such blanks shall be determined by the state department of health.

Sec. 1243-3. Reports made under this act shall not be evidence of the facts therein stated in any action arising out of the disease therein reported.

Sec. 1243-4. It shall furthermore be the duty of the state department of health to transmit a copy of all such reports of occupational disease to the proper official having charge of factory inspection.

Sec. 1243-5. Whoever being a physician practicing in the state of Ohio neglects or refuses to make and transmit to the state commissioner of health any report provided for in Section 1243-1 of the General Code shall be fined not to exceed one hundred dollars or imprisoned for not to exceed ninety days, or both, but no person shall be imprisoned under this section for a first offense and the prosecution shall always be as and for a first offense unless the affidavit upon which the prosecution is instituted contains the allegation that the offense is a second or repeated offense.

.NOTE—In addition to the diseases or disabilities provided for in Section 1243-1 of the above law, the regulations passed by the Public Health Council on February 27, 1920, provide in Regulation 2 for the reporting of "any diseases or disability contracted as a result of the nature of the person's employment, including the following diseases or disabilities *and not excluding others*:"

Anilin poisoning	Bisulphide of carbon poisoning	Naphtha poisoning
Benzine (gasoline) poisoning	Carbon monoxide poisoning	Natural gas poisoning
Benzol poisoning	Dinitrobenzene poisoning	Turpentine poisoning

The same Legislature which passed the preceding laws added another milestone to industrial hygiene progress when it enacted the so-called "Lead Law" (O. L. 103, p. 819) which placed the reporting features under the supervision of the State Board of Health, and provided protection against lead poisoning and for monthly physical examinations of the workers. In accordance with the aforementioned laws, a division of occupational disease was established in the State Board of Health on May 15, 1913.

In compliance with Joint House Resolution No. 12, quoted previously, Dr. E. R. Hayhurst and his associates made a detailed survey of industrial hygiene and occupational diseases. The data gained in this survey was printed in a 438-page volume entitled "A Survey of Industrial Health-Hazards and Occupational Diseases in Ohio" and was officially reported to the Legislature in February, 1915. This report covered 1,067 workplaces employing 235,984 wage-earners, or about half of those industrially employed in the State. Coal mining, transportation, mercantile work, and the professions were not included in the report.

Concurrent with these activities of the Department of Health, the Industrial Commission (whose administrative functions are now carried on by the Department of Industrial Relations, and educational functions by the Division of Safety and Hygiene), was devising various safety and

health codes for factories and workshops, foundries, potteries, metal and woodworking industries, elevators, explosives, etc.

The accumulation of experience regarding occupational diseases by the Department was used as the basis for a schedule of diseases to be compensated similarly to industrial accidents through a Legislative Act passed April 20, 1921 (O. L. V. 109, p. 181). This schedule included a list of 15 afflictions as follows: (1) Anthrax, (2) Glanders, (3) Lead poisoning, (4) Mercury poisoning, (5) Phosphorus poisoning, (6) Arsenic poisoning, (7) Poisoning by benzol or by nitro and amido-derivatives of benzol (dinitro-benzol, aniline and others), (8) Poisoning by gasoline, benzine, naphtha, or other volatile petroleum products, (9) Poisoning by carbon bisulphide, (10) Poisoning by wood alcohol, (11) Infection or inflammation of the skin on contact surfaces due to oils, cutting compounds or lubricants, dust, liquids, fumes, gases or vapors, (12) Epithelioma-cancer or ulceration of the skin or of the corneal surface of the eye due to carbon, pitch, tar or tarry compounds, (13) Compressed air illness, (14) Carbon dioxide poisoning, and (15) Brass or zinc poisoning.

The Legislature of 1921 also empowered the Industrial Commission to investigate and ascertain the hazards productive of the fifteen diseases specified so that, while funds were set aside for immediate compensation purposes, the Commission, after July 1, 1924, would be enabled to classify occupations and industries according to the degree of hazard found in each in order to fix premium rates to provide an adequate fund for compensation payments in the future. The Commission was also empowered to "employ and detail to such (investigative) work such physicians, examiners, clerks and assistants as shall be necessary". However, on account of the failure to provide sufficient funds for this purpose only one part-time physician was employed to make these special investigations, outside of what could be done by the regular medical examining staff employed for accident claims. This necessarily resulted in investigating only cases of special controversial nature, some of which had to be turned over to outside specialists. The plan referred to above was changed to a flat rate of \$0.01 on each \$100 payroll, the industry rate having been found too cumbersome. This was continued to July 1, 1937, when the rate was raised to \$0.02 on each \$100 payroll to meet the expected increase in claims due to the inclusion of Silicosis in the compensable schedule.

Owing to the fact that there was in the state an apparent overlapping of duties of the Department of Industrial Relations and the State Department of Health because of the passage of this Occupational Disease Compensation Act in 1921, an advisory letter was obtained from the

Attorney General, September 12, 1921, differentiating the duties of the two Departments and laying down those of the Department of Health as follows: "Seemingly the duty of your Department is to observe and study all diseases that might later of necessity come to be classified with occupational diseases * * *" and suggesting that a convenient workable inter-departmental arrangement should be devised to avoid duplication of occupational disease reports by physicians to the two Departments. This feature was then worked out between the Departments.

In July, 1929, three more occupational diseases, namely, (1) manganese dioxide poisoning, (2) radium poisoning, (3) tenosynovitis of the flexor or extensor muscles of the hand, and prepatellar bursitis were added to the compensable schedule. In July, 1931, chrome ulceration, potassium cyanide poisoning, and sulphur dioxide poisoning were added and on July 31, 1937, silicosis became the twenty-second compensable occupational disease in Ohio.

Due to the technicalities contained in Workmen's Compensation Law pertinent to compensable occupational diseases, the following sections are reproduced:

Sec. 1465-68a.* (Compensation of disabled employee or dependents; who entitled. Compensable occupational diseases; schedule.) Every employee who is disabled because of the contraction of an occupational disease as herein defined, or the dependents of an employee whose death is caused by an occupational disease as herein defined, shall, on and after July 1st, 1921, be entitled to the compensation provided by sections 1465-78 to 1465-82, inclusive, and section 1465-89 of the General Code, subject to the modifications hereinafter mentioned; provided that no person shall be entitled to such compensation unless for ninety days next preceding the contraction of the disease the employee has been a resident of the state of Ohio or for ninety days next preceding the contraction of the disease has been employed by an employer required by the workmen's compensation law of Ohio to contribute to the occupational disease fund of Ohio for the benefit of such employee, or to compensate such employee directly under the provisions of section 1465-69 of the General Code.

The following diseases shall be considered occupational diseases and compensable as such, when contracted by an employee in the course of his employment in which such employee was engaged at any time within twelve months previous to the date of his disablement and due to the nature of any process described herein:

SCHEDULE

Description of disease or injury	Description of process
1. Anthrax.	Handling of wool, hair, bristles, hides and skins.
2. Glanders.	Care of any equine animal suffering from glanders; handling carcass of such animal.

* As amended effective July 31, 1937.

Description of disease or injury	Description of process
3. Lead poisoning.	Any industrial process involving the use of lead or its preparations or compounds.
4. Mercury poisoning.	Any industrial process involving the use of mercury or its preparations or compounds.
5. Phosphorus poisoning.	Any industrial process involving the use of phosphorus or its preparations or compounds.
6. Arsenic poisoning.	Any industrial process involving the use of arsenic or its preparations or compounds.
7. Poisoning by benzol or by nitro and amido-derivatives of benzol (dinitrobenzol, anilin and others).	Any industrial process involving the use of benzol or a nitro- or amido-derivative of benzol or its preparations or compounds.
8. Poisoning by gasoline, benzine, naphtha, or other volatile petroleum products.	Any industrial process involving the use of gasoline, benzine, naphtha, or other volatile petroleum products.
9. Poisoning by carbon bisulphide.	Any industrial process involving the use of carbon bisulphide or its preparations or compounds.
10. Poisoning by wood alcohol.	Any industrial process involving the use of wood alcohol or its preparations.
11. Infection or inflammation of the skin on contact surfaces due to oils, cutting compounds or lubricants, dust, liquids, fumes, gases or vapors.	Any industrial process involving the handling or use of oils, cutting compounds or lubricants, or involving contact with dust, liquids, fumes, gases or vapors.
12. Epithelioma cancer or ulceration of the skin or of the corneal surface of the eye due to carbon, pitch, tar or tarry compounds.	Handling or industrial use of carbon, pitch or tarry compounds.
13. Compressed air illness.	Any industrial process carried on in compressed air.
14. Carbon dioxide poisoning.	Any process involving the evolution or resulting in the escape of carbon dioxide.
15. Brass or zinc poisoning.	Any process involving the manufacture, founding or refining of brass or the melting or smelting of zinc. (109 v. 183.)
16. Manganese dioxide poisoning.	Any process involving the grinding or milling of manganese dioxide or the escape of manganese dioxide dust.

Description of disease or injury**Description of process**

- | | |
|--|---|
| 17. Radium poisoning. | Any industrial process involving the use of radium and other radio active substances, in luminous paint. |
| 18. Tenosynovitis and prepatellar bursitis. | Primary tenosynovitis characterized by a passive effusion or crepitus into the tendon sheath of the flexor or extensor muscles of the hand, due to frequently repetitive motions or vibration or prepatellar bursitis due to continued pressure. |
| 19. Chrome ulceration of the skin or nasal passages. | Any industrial process involving the use of or direct contact with chromic acid or bichromates of ammonium, potassium or sodium or their preparations. |
| 20. Potassium cyanide poisoning. | Any industrial process involving the use of or direct contact with potassium cyanide. |
| 21. Sulphur dioxide poisoning. | Any industrial process in which sulphur dioxide gas is evolved by the expansion of liquid sulphur dioxide. |
| 22. Silicosis. (Silicosis shall mean a disease of the lungs caused by breathing silica dust (silicon dioxide) producing fibrous nodules, distributed through the lungs and demonstrated by x-ray examination or by autopsy.) | <p>Nothing in this act shall entitle an employee or his dependents to compensation, medical treatment, or payment of funeral expenses for disability or death from silicosis, unless the employee has been subject to injurious exposure to silica dust (silicon dioxide) in his employment in Ohio preceding his disablement, for periods amounting in all to at least five years, some portion of which shall have been after the effective date of this act.</p> <p>Compensation, medical, hospital and nursing expenses on account of silicosis shall be payable only in the event of temporary total disability, permanent total disability, or death, and only in the event of such disability or death resulting within one year after the last injurious exposure; provided that in the event of death following continuous total disability commencing within two years after the last injurious exposure, the requirement of death within two years after the last injurious exposure shall not apply.</p> <p>In the event that an employee has been subject to injurious exposure to silica dust (silicon dioxide) in his employment in Ohio for periods amounting in all to at least five years after the effective date of this act, such compensation shall be paid in accordance with the provision of sections 1465-79, 1465-81 and 1465-82 of the General Code; but in the event that such exposure after the effective date of this</p> |

Description of disease or injury

Silicosis—(Continued)

Description of process

act shall have amounted to less than five years, then the maximum aggregate amount payable for disability, death, or disability and death shall not exceed the sum of five hundred dollars plus fifty dollars for each calendar month which may elapse after the effective date of this act before the month in which disability shall begin but shall not exceed, in any event, the sum of three thousand dollars.

Claims for compensation on account of silicosis shall be forever barred unless application shall have been made to the industrial commission within one year after total disability began or within six months after death.

Nothing in this act shall entitle an employee or his dependents to compensation, medical, hospital and nursing expenses or payment of funeral expenses for disability or death due to silicosis in the event of the failure or omission on the part of the employee truthfully to state, when seeking employment, the place, duration and nature of previous employment in answer to an inquiry made by the employer.

The industrial commission shall appoint three referees to be known as "silicosis referees" who shall be licensed physicians in good professional standing who have by special duty, or experience, or both, acquired special knowledge of pulmonary diseases and at least one of said physicians shall be a roentgenologist. Before awarding compensation for disability or death due to silicosis, the industrial commission shall refer the claim to the silicosis referees for examination and recommendation with regard to the diagnosis, the extent of disability and other medical questions connected with the claim. An employee shall submit to such examinations, including clinical and x-ray examinations, as the commission may require. The commission may designate a duly licensed physician, a pathologist, or such other specialist as may be deemed necessary, to make an autopsy examination and tests to determine the cause of death and certify written findings to the silicosis referees. In the event that an employee refuses to submit to examinations, including clinical and x-ray examinations, after notice from the commission, or in the event that a

Description of disease or injury

Silicosis—(Concluded)

Description of process

claimant for compensation for death due to silicosis fails to produce necessary consents and permits, after notice from the commission, so that such autopsy examination and tests may be performed, then all rights for compensation shall thereupon be forfeited. The reasonable compensation of said silicosis referees and of such specialists and the expenses of examinations and tests shall be paid, if the claim is allowed, as part of the expenses of the claim, and otherwise form the surplus fund.

Sec. 1465-68b. (Who entitled to rights and benefits and subject to liabilities and penalties. Collection, administration and disbursement of fund.) Every employee mentioned in the next preceding section and the dependent or dependents of such employee and the employer or employers of such employee shall be entitled to all the rights, benefits and immunities and shall be subject to all the liabilities, penalties and regulations provided for injured employees and their employers by sections 1465-44 to 1465-108, General Code, inclusive, save and except section 1465-90, General Code, which shall not apply to any case involving occupational disease, and also subject to such other modifications or exemptions hereinafter provided.

The industrial commission shall have all of the powers, authority and duties with respect to the collection, administration and disbursement of the state occupational disease fund as are provided for in sections 1465-44 to 1465-108, General Code, inclusive, providing for the collection, administration and disbursement of the state insurance fund for the compensation of injured employees. (109 v. 185.)

Sec. 1465-72b. (Claims for compensation in occupational disease; to whom made.) In all cases of occupational disease, or death resulting from occupational disease, claims for compensation shall be forever barred, unless, within four months after the disability due to the disease began, or six months after death occurred, application shall be made to the industrial commission of Ohio, or to the employer in the event such employer has elected to pay compensation direct, except in such cases as are provided for in Section 1465-82, subdivision 4, General Code (Effective August 16, 1937.)

In addition to its other duties the Bureau is occasionally called upon to determine whether particular employment of minors (O. L. V. 103, p. 912) and of children (O. L. V. 103, p. 911) shall be prohibited in certain occupations. Authority for these rulings is embodied in the following laws:

Sec. 13003. (Board shall determine whether particular employment of minors shall be prohibited.) The state board of health may, from time to time, after a hearing duly had, determine whether or not any particular trade, process of manufacture or occupation in which the employment of children under the age of sixteen years is not already forbidden by law, or any particular method of carrying on such trade, process of manufacture or occupation, is sufficiently dangerous to the lives or limbs or injurious to the health or morals of children under sixteen years of age to justify their exclusion therefrom. No child under sixteen years of age shall be employed, permitted or suffered to work in any occupation thus determined to be dangerous or injurious to such children. There shall be a right of appeal to the common pleas court from any such determination. (103 v. 912.)

Sec. 13007-4. (Board may determine whether employment of children shall be prohibited in certain occupations.) The state board of health may, from time to time, after hearing duly had, determine whether or not any particular trade, process of manufacture or occupation, in which the employment of children under eighteen years of age is not already forbidden by law, or any particular method of carrying on such trade, process of manufacture or occupation, is sufficiently dangerous to the lives or limbs or injurious to the health or morals of children under eighteen years of age to justify their exclusion therefrom.

No child under eighteen years of age shall be employed, permitted or suffered to work in any occupation thus determined to be dangerous or injurious to such children. There shall be a right of appeal to the common pleas court from any such determination. (103 v. 911.)

The requirement of reporting occupational diseases to the Department of Health has given the Bureau the opportunity for the past twenty-five years of studying the occurrence of diseases as related to specific industries and occupations. A facsimile of the report used is shown opposite this page. Following the legislation of 1921, the number of occupational disease reports increased rapidly from year to year. Most of the reports received came under the schedule of compensable cases, but non-compensable disease reports increased also. In compiling statistics of the diseases reported from May 15, 1913 to January 1, 1938, it is necessary to divide the cases into "compensable" where they fall within the scheduled list, and "non-compensable" where they have not, although, in a given case, compensation, which is determined by the Industrial Commission may or may not have been rendered depending on other circumstances than diagnosis alone.

From the data of the first report (May 15, 1913) to the end of the year 1937 (22,027) cases of occupational diseases have been reported to the Ohio Department of Health. Prior to 1921 (when the schedule of Compensable Occupational Diseases became effective), 2,575 reports were received by the Department. Of these, 1,954 were classified as "compensable" and 621 were classified as "non-compensable". From 1921 to January 1, 1938, 19,452 reports were received.

The increase in reported occupational diseases in Ohio is due, we think, not so much to an increased incidence of occupational diseases, but to the gradual increase in the number of cases reported which is the result of compensation legislation and spread of information by the Department of Health and the Department of Industrial Relations over a period of years.

By the provisions of amended Senate Bill No. 297—enacted by the 93rd General Assembly, Regular Session, 1939-1940. "To amend section 1465-68a and section 1465-70 and to enact supplemental section 1465-68d of the General Code, relative to workmen's compensation, and to declare an emergency"—"All Other Occupational Diseases In Ohio," subject to certain qualifications and provisions, were added to the schedule as number 23.

THE UNITED STATES PUBLIC HEALTH SERVICE
Cooperating With
OHIO DEPARTMENT OF HEALTH

U. S. TREASURY DEPARTMENT
Public Health Service
(April, 1938)

Form 1438

WRITE PLAINLY WITH INK—THIS IS A PERMANENT RECORD

N. B.—Every item of information should be carefully supplied. The exact statement of OCCUPATION is very important. Physicians should state DIAGNOSIS in plain terms. See instructions on back of certificate.

CERTIFICATE OF INDUSTRIAL OR OCCUPATIONAL DISEASE

Name of Patient (Last name) (First name) (Second name)

Address: Street and No. City or Village.

PERSONAL AND STATISTICAL PARTICULARS

Sex	Age	Color	Country of Birth
Single, married, widowed, or divorced (<i>write the word</i>)			
OCCUPATION			
(a) Trade, occupation, or work (in which disease was acquired)			
Particular kind of work in such trade, etc.			
Date of entering this occupation			
Employer's name			
Address			
Employer's business (goods made or work done)			
(b) Previous occupations:			
Name of occupations		Entered (year)	Left (year)

Previous illnesses, if any, due to occupation:	Year
Disease or illness	

MEDICAL CERTIFICATE OF DISEASE

Diagnosis
Chief symptoms and conditions
Date first symptoms appeared
Complicating diseases (such as alcoholism, syphilis, tuberculosis, etc.)
What substance(s) or condition(s) in your opinion caused this affliction?
Duration (actual, estimated)
(Check which)
Additional facts

Date of diagnosis	193
(Signed)	M. D.
(Address)	

Mail to COLLABORATING EPIDEMIOLOGIST, U. S. Public Health Service, State Department of Health, Columbus, Ohio.

See Other Side For Instructions

INSTRUCTIONS FOR FILLING OUT CERTIFICATE

PRESENT OCCUPATION.—*Precise* statement of occupation is very important so that the relative healthfulness of various pursuits may be known. It is necessary to know both general trade or occupation (for example, *printer*) and also the particular kind of work or branch of trade (as *hand compositor* or *linotype operator*).

Date of entering this occupation is important to determine how long the worker may have been exposed to the hazard before contracting the disease. *Employer's name, address and business* are necessary to ascertain distribution of occupational diseases by industries, many trades (e. g., machinists) being common to different industries.

PREVIOUS OCCUPATIONS need to be known, if possible, because present illness may be due to a former rather than present occupation. Give simply the name of each distinct occupation which the patient may

have followed, with the year he entered and the year he left.

PREVIOUS ILLNESSES.—This refers either to previous attacks of present disease, or to any other disease, *due to occupation*. All that is required is the name of each such disease or illness with the year in which it occurred.

MEDICAL CERTIFICATE.—Only two of the items specified for this require any explanation. In making these reports it is necessary to consider the possible influence of factors other than occupation as causes of the disease. For this reason any *complicating diseases* should be noted, such, for example, as alcoholism or syphilis in connection with arteriosclerosis in cases of lead or other metal poisoning. The possible effect of other factors, such as poor hygienic conditions in the home, or other personal conditions, must be considered, and when discoverable should be noted under *additional facts*.

AN ACT—To Require the Reporting of Occupational Diseases—(As amended February 4, 1920)

Be it enacted by the General Assembly of the State of Ohio:

Report of occupational diseases by physicians

When and to whom to be made

Blanks for report

Such reports not evidence

Copy of report to be transmitted to proper official

Penalty

Section 1243-1.—Every physician in this State attending on or called in to visit a patient whom he believes to be suffering from poisoning from lead, phosphorus, arsenic, brass, wood alcohol, mercury, or their compounds, or from anthrax or from compressed-air illness and such other occupational diseases and ailments as the State department of health shall require to be reported, shall within 48 hours from the time of first attending such patient send to the State commissioner of health a report stating:

(a) Name, address, and occupation of patient. (b) Name, address, and business of employer.

(c) Nature of disease. (d) Such other information as may be reasonably required by the State department of health. The reports herein shall be made on, or in conformity with, the standard schedule blanks hereinafter provided for. The mailing of the report, within the time required, in a stamped envelope addressed to the office of the State commissioner of health, shall be a compliance with this section.

Section 1243-2.—The State department of health shall prepare and furnish, free of cost, to the physicians included in the preceding section, standard schedule blanks for the reports required under this act. The form and contents of such blanks shall be determined by the State department of health.

Section 1243-3.—Reports made under this act shall not be evidence of the facts therein stated in any action arising out of the disease therein reported.

Section 1243-4.—It shall furthermore be the duty of the State department of health to transmit a copy of all such reports of occupational disease to the proper official having charge of factory inspection.

Section 1243-5.—Whoever being a physician practicing in the State of Ohio, neglects or refuses to make and transmit to the State commissioner of health any report provided for in Section 1243-1 of the General Code shall be fined not to exceed one hundred dollars or imprisoned for not to exceed 90 days, or both, but no person shall be imprisoned under this section for a first offense and the prosecution shall always be as and for a first offense unless the affidavit upon which the prosecution is instituted contains the allegation that the offense is a second or repeated offense.

NOTE.—In addition to the diseases or disabilities provided for in Section 1243-1 of the above law, the regulations passed by the Public Health Council on February 27, 1920, provide in Regulation 2 for the reporting of "any disease or disability contracted as a result of the nature of the person's employment, including the following diseases or disabilities *and not excluding others*:"

Anilin poisoning.
Benzene (gasoline) poisoning.
Benzol poisoning.
Bisulphide-of-carbon poisoning.
Carbon-monoxide poisoning.
Dinitrobenzene poisoning.
Naphtlia poisoning.
Natural-gas poisoning.
Turpentine poisoning."

NOTE.—A schedule of occupational diseases compensable in Ohio will be sent upon request to the Collaborating Epidemiologist, U. S. Public Health Service, State Department of Health, Columbus, Ohio.

Until 1936, the duties of the Bureau of Occupational Diseases were performed by Dr. Emery R. Hayhurst who was consultant in occupational diseases, with the assistance of a secretary. At various intervals, another physician was employed as chief of the Bureau. At no time were there more than two technical workers until 1936 when the personnel of the Bureau was increased under provisions of the Social Security Act.

With the enactment of the national Social Security Act, a part of the fund was ear-marked especially to the U. S. Public Health Service for the purpose of extending investigations in industrial hygiene and occupational diseases. Early in 1936, the Ohio State Director of Health, the



MOBILE INDUSTRIAL HYGIENE LABORATORY—The specially constructed, light-proof body of this truck is divided into two compartments. The front compartment contains the X-ray tube, control panel, cassette changer, X-ray transformer, and ventilating apparatus. The rear compartment is equipped with laboratory desks, cabinets, sink, water tank, and X-ray film box. The X-ray is a fully rectified, 200 milliamperage capacity unit, and is shock proof. Teleoroentgenograms are taken.

Legislature, and the Governor promptly approved this subsidy for Ohio. This permitted the expansion of the Bureau of Occupational Diseases to three physicians, a chemical engineer, a chemist, a technical assistant, and another stenographer. An industrial hygiene laboratory was established and plans for a mobile X-ray, clinical, and chemical laboratory were conceived. In October, 1937, this unit, housed in a specially constructed truck, was put into operation in the field.

Since the expansion of the personnel of the Bureau, the scope of its activities have necessarily been increased. Definite objectives have been

set. In procedure the following functions are now a definite part of the Bureau's program:

1. Investigation of the kind and extent of the diseases and poisonings to which workers in industry are subject in consequence of their work.
 - (a) By administration of the Occupational Disease Reporting Law which requires physicians to report all diseases believed due to occupation.
 - (b) The evaluation of reports received from the physicians.
 - (c) By comparison of morbidity and mortality statistics gathered with those of other industrial hygiene units, departments of vital statistics, insurance companies, and other sources.
2. Analysis of the findings of such investigations and the making of reports thereon.
3. Joint medical and engineering studies of all possible places where the health of the workers is excessively or needlessly endangered. This includes physical examination of employes with necessary laboratory and X-ray studies, specific determinations of dusts, gases, fumes, mists, and other toxic materials. Here may be included work relating to factory ventilation, illumination, and sanitation.
4. Co-operation with other state agencies (Industrial Commission and Department of Labor Relations), other interests (medical and insurance), and agencies outside the State (The United States Public Health Service and other state health and labor departments) by consultations and conferences of technical nature concerning the health of workers in hazardous processes and trades, and to serve as an exchange medium of procedures most effective in an industrial hygiene program.
5. Consultation with physicians on request.
6. The care of requests for aid in all matters of industrial hygiene which are divided into three classes:
 - (a) Official
 - (b) Manufacturers and employees, and
 - (c) Others.
7. Determination and establishment of standards and thresholds of toxicity for materials encountered by the worker and devising of adequate control measures.
8. Special investigations and assignments as the occasions arise (e. g., carbon monoxide poisoning cases from domestic heating appliances and motor exhaust) and co-operation and assistance in emergencies or calamities.
9. Supervision of the reports of periodic medical examinations of employes in those industries coming under the provisions of the "Lead Law" (O. G. C., Section 6330-7).
10. Determination when requested whether particular employment of minors (O. G. C., Section 13003), and of children (O. G. C., Section 13007-4) shall be prohibited in certain occupations.
11. Research into the effect of new materials and processes on the health of workers.
12. Publicity designed to secure the good will of the public and arouse interest in occupational hazards by—
 - (a) Circularization of all physicians in the State informing them of the Reporting Law and of the importance of it.
 - (b) Collection, preparation, and distribution of literature for education and enlightenment covering health hazards in industry.
 - (c) Establishment of co-operative relations with local health and sanitary units, medical and nursing groups, insurance carriers, and other interested groups.

- (d) Establishment of a correspondence service as well as a consultation service.
 - (e) Lectures on industrial hygiene and occupational diseases to medical, employer, and labor groups. Radio addresses and interviews.
 - (f) Publication of scientific papers by the personnel in journals of repute.
13. Compilation of an adequate reference library.

ADULT HYGIENE DIVISION

Prior to completion and publication of this Survey, the Bureau of Occupational Diseases, under whose direction the included data was collected, was abolished in accordance with the provisions of a Reorganization Act passed by the 93rd General Assembly.

Reorganization of the Ohio Department of Health by the Public Health Council and the Director of Health February 1, 1940, established eight new divisions to replace the twenty divisions and bureaus previously existing. This plan of organization made for greater flexibility of administration and promoted interdepartmental cooperation. It also provided for the placing of special programs under the supervision of especially trained control officers and for the addition of consultants as required.

Among the eight divisions created under the Reorganization Act was an Adult Hygiene Division, which was charged with the solution of the special health problems applicable to adults. Industrial hygiene activities, including administration of the occupational disease reporting law and the study of occupational diseases as well as the laboratory and other facilities of the obsolete Bureau of Occupational Diseases, logically fell within the scope of special health service to adults and were consequently placed under the direction of the Adult Hygiene Division.

The Ohio Department of Health's program for adult health improvement and maintenance also deals with such related adult health problems as venereal diseases, cancer, pneumonia, appendicitis, geriatrics or degenerative diseases and mental hygiene. Thus, a comprehensive plan of offering material assistance in health matters concerning adults has been achieved.

Completion and publication of the Industrial Survey is believed to be an important step forward in the campaign directed towards maintaining and improving the health of workers.

Hayhurst, E. R.: Industrial Health Hazards and Occupational Diseases in Ohio, Ohio State Board of Health, Columbus, 1915.
 Ohio Department of Health Thirty-first Report, 1915-1929, Columbus, 1931.
 Smith, K. D., and Kistler, J. B.: Occupational Diseases in Ohio—1937, Ohio Department of Health, Columbus, 1938.
 General Code of Ohio; Ohio Laws.

THE SCOPE AND PLAN OF THE SURVEY

Two main objectives were established for this survey. These were the recording by occupation of the number of persons exposed to environmental conditions which might be hazardous to health and the compiling of certain information regarding health conservation measures available to these workers. In 1930, according to the Bureau of Census, 2,615,938 persons were engaged in gainful occupation in the State of Ohio. A complete survey of the industrial environment of this number would have been impossible with the limited time and personnel available for the study. Therefore, certain industry and service groups which past experience has shown to be relatively free from serious occupational disease hazards were omitted. These included agriculture, forestry and fishing, building, independent hand trades, professional service, transportation and communication (except garages), and domestic and personal service (except laundries and dry cleaning). The remaining groups, which included extraction of minerals, manufacturing and mechanical industries, garages, laundries and dry cleaning, were submitted to a sampling procedure as outlined by the United States Public Health Service, Washington, D. C., and described below.

Various Ohio State governmental agencies cooperated in furnishing lists of industrial establishments which were submitted to the sampling procedure. The list of manufacturing and mechanical industries was obtained from the Ohio Department of Industrial Relations which maintains a complete and up-to-date file of all such establishments in the State, classified into 245 groups. A list of garages was obtained from the Actuarial Department of the Industrial Commission. A list of mines was obtained from the Bureau of Mine Inspection, Department of Industrial Relations, and lists of laundries and dry cleaning establishments were obtained from the office of the State Fire Marshal. For sampling purposes the cards furnished by the Department of Industrial Relations were classified into the 245 individual sub-groups, all plants employing less than six workers being discarded. Because of the varying types and number of hazards which were known to exist in the different types of establishments in the manufacturing and mechanical industries, it was deemed advisable to vary the percentage of plants selected for surveying in different industrial groups. For example, a 50% sample was taken in the chemicals; clay, glass and stone; metals (other than iron and steel); and miscellaneous manufacturing industries, while in certain food and lumber industries only 10% of plants were included in the sample. The remaining groups were sampled between 10% and 50% of their listed

establishments. The industrial groups in which a small percentage sample was selected for survey were characterized by a relative uniformity in procedure and methods of manufacture and comprised a large number of establishments, whereas groups in which a large percentage sample was selected were comprised of a small total number of establishments and characterized by a great diversity of operations. The final sample was then checked in order to assure a population distribution comparable to the percentage of plants sampled. Any discrepancies such as an excessively large or small population percentage was corrected by re-sampling. The completed sample was then filed by counties and in the larger counties by sections.

For the actual surveying, a group of 16 surveyors was engaged and was given a series of preliminary lectures on industrial hygiene by Mr. J. J. Bloomfield, Sanitary Engineer, United States Public Health Service, Washington, D. C. They were kept for an additional week in and around the vicinity of Columbus for actual field work with regular members of the Bureau staff, after which time they were assigned to plants in various parts of the State. A letter stating the scope and purpose of the study and asking the management to provide a suitable informant to assist in the collection of the necessary information was sent to the plant to be surveyed a few days before the expected visit of the surveyor. After the preliminary instruction period, the surveyors were divided into two groups, each of which was supervised by one of the regular staff members. Each surveyor gave his completed forms to his group supervisor who forwarded or carried them to the main office for editing and tabulating.

The completed surveys recorded the number of workers, male and female, engaged in various occupations; a brief description of the occupation; a listing of the raw materials and by-products encountered; and an indication of ventilation facilities and control measures employed. (See appendix for survey forms). These completed forms were then given to the editor who indicated exposures to the various substances and noted the related control measures. This was accomplished by means of a coding scheme which included all substances in 50 major material classifications. (See appendix for list of materials). The edited surveys were then classified according to industrial groups and plants with less than five employees were discarded. Four clerks transcribed the edited data to suitable forms for final summary and analysis.

As the study progressed, the surveyors reported a number of plants which could not be surveyed. The reasons offered included such phrases as "out of business," "too small," "not operating," "unable to locate," "no longer engaged in manufacturing operations," etc. These assignments were placed in a separate file, and a new plant corresponding in type and size to the one discarded was chosen from the reserve files to

replace it. The cooperation on the part of industrial management proved most gratifying. Most surveyors encountered no refusals and all reported an intelligent interest regarding industrial hygiene problems.

Collection of information relating to syphilis in industry was part of the nation-wide activity of the United States Public Health Service. The syphilis forms completed by the surveyors were returned to their sponsor for analysis and are not included in this report.

RESULTS OF THE STUDY

Type of Industries Surveyed

Table 1 shows the number of establishments surveyed in each industrial classification, together with the total number of workers, males and females, in each. The survey covered 2,901 industries with a total population of 300,674. Approximately 88% of all plants surveyed were in the manufacturing and mechanical industries, comprising 2,546 plants with 286,247 workers. The remainder of the survey included 42 mines with 7,731 employees, 104 laundries and dry cleaning establishments with 3,635 employees, and 209 garages with 3,061 employees. Of all workers surveyed, 242,059, or 80.5%, were males, and 58,615, or 19.5%, females. It is believed that this represents an adequate sample of Ohio industries, particularly in the manufacturing and mechanical industries which other studies have demonstrated to be the greatest source of health hazards.

TABLE 1—NUMBER OF PLANTS AND EMPLOYEES IN OHIO INDUSTRIES AND SERVICE GROUPS SURVEYED

Industry or Service Group	Number of Plants	Number of Workers		
		Total	Male	Female
EXTRACTION OF MINERALS:				
Coal mines	39	7,543	7,529	14
Other mines	3	188	178	10
Total extraction of minerals.....	42	7,731	7,707	24
MANUFACTURING AND MECHANICAL INDUSTRIES:				
Chemical and Allied Industries:				
Charcoal and coke.....	3	379	372	7
Explosives and ammunition.....	7	423	293	130
Fertilizer factories	23	953	934	19
Paint and varnish.....	39	2,468	1,932	536
Petroleum products	12	853	779	74
Rayon	1	117	90	27
Soap factories	15	3,475	2,526	949
Blackings, cleaners, etc.....	11	240	139	101
Chemicals (as such).....	82	2,910	2,741	169
Dyestuffs, inks	8	521	494	27
Matches	3	940	539	401
Patent medicines, drugs.....	24	890	445	445
Other chemicals	18	668	610	48
Total chemical and allied.....	196	14,827	11,894	2,933
Cigar and Tobacco Factories:				
Cigars and tobacco.....	21	2,567	702	1,865
Total cigar and tobacco factories.....	21	2,567	702	1,865

TABLE 1—NUMBER OF PLANTS AND EMPLOYEES IN OHIO INDUSTRIES AND SERVICE GROUPS SURVEYED—Continued

Industry or Service Group	Number of Plants	Number of Workers		
		Total	Male	Female
MANUFACTURING AND MECHANICAL INDUSTRIES—Continued:				
Clay, Glass, and Stone:				
Brick and tile.....	71	4,797	4,716	81
Glass factories	20	7,265	5,782	1,483
Glass mirrors	7	213	193	25
Lime, cement, and artificial stone.....	51	1,778	1,699	79
Marble and stone yards.....	26	524	502	22
Potteries	35	5,088	3,453	1,585
Asphalt and roofing materials.....	17	430	399	31
Other clay, glass, and stone.....	16	709	685	24
Total clay, glass, and stone.....	243	20,759	17,429	3,330
Clothing:				
Gloves	8	1,315	182	1,133
Hats and caps.....	13	292	121	171
Shirts, collars, and cuffs.....	12	1,196	173	1,023
Suits, coats, and overalls.....	68	6,797	2,501	4,296
Women's light clothing.....	49	3,680	649	3,031
Fur goods	11	183	75	113
Other clothing	7	290	56	234
Total clothing	168	13,768	3,757	10,001
Food and Allied Industries:				
Bakeries	95	3,538	2,454	1,084
Dairy products	43	1,725	1,461	264
Candy	19	778	294	484
Flour and grain.....	34	1,283	1,040	243
Slaughter and packing houses.....	31	1,669	1,500	169
Ice manufacture	32	533	488	45
Liquor, beer and wine.....	25	2,508	2,266	242
Soft beverages	36	743	651	92
Other foods	33	1,813	1,140	673
Total food and allied industries.....	353	14,680	11,294	3,386
Iron and Steel:				
Agricultural implements	6	647	589	58
Automobile factories	51	12,809	11,252	1,557
Blast furnaces and steel rolling mills.....	17	39,089	32,507	6,581
Car and railroad shops.....	4	1,761	1,721	40
Ship and boat building.....	3	673	667	6
Foundries	96	21,306	20,316	990
Welding, forging, and heat treating.....	277	35,998	32,324	3,674
Machine shops	161	6,165	5,585	580
Total iron and steel.....	615	112,447	105,461	6,986
Metal Industries (except iron and steel):				
Brass factories	66	7,232	6,740	492
Clock and watch factories.....	2	372	273	99
Copper factories	8	466	417	49
Jewelry	14	315	215	100
Lead and zinc.....	4	181	169	12
Tin and enamelware.....	22	3,112	2,316	796
Aluminum products	17	2,092	1,943	149
Electroplating	29	554	538	16
Other	21	1,063	897	166
Total metal industries (except iron and steel)...	185	15,887	13,508	1,879

TABLE 1—NUMBER OF PLANTS AND EMPLOYEES IN OHIO INDUSTRIES AND SERVICE GROUPS SURVEYED—Continued

Industry or Service Group	Number of Plants	Number of Workers		
		Total	Male	Female
MANUFACTURING AND MECHANICAL INDUSTRIES—Concluded:				
Leather:				
Leather belts and goods.....	13	516	312	204
Shoes	13	5,060	2,328	2,732
Tanneries	4	718	709	9
Trunks and suitcases.....	5	177	117	60
Total leather	35	6,471	3,466	3,005
Lumber and Furniture:				
Wood, wicker, and upholstered furniture.....	37	1,322	1,067	255
Metal furniture	18	3,020	2,586	434
Other furniture	18	420	387	33
Planing and milling.....	51	1,004	884	120
Other woodworking	55	2,444	2,009	435
Total lumber and furniture.....	179	8,210	6,933	1,277
Paper, Printing, and Allied Industries:				
Blank books and paper products.....	19	1,173	778	395
Paper and pulp mills.....	10	1,170	961	209
Paper box factories.....	25	1,888	1,204	679
Engraving and photographic work.....	31	646	560	85
Printing and publishing.....	69	6,472	4,701	1,771
Total paper, printing, and allied industries.....	154	11,343	8,204	3,139
Textile:				
Cotton goods	9	424	235	189
Knit goods	12	1,337	123	1,184
Textile dyeing and finishing.....	5	687	588	49
Woolen and worsted.....	6	2,302	775	1,527
Embroideries and laces.....	5	211	58	153
Tents and awnings.....	24	480	231	249
Mattresses and bedding.....	20	524	407	117
Other textiles	80	2,122	1,156	966
Total textile	111	8,007	3,573	4,434
Rubber:				
Rubber tires	11	15,328	13,215	2,113
Other rubber factories.....	42	2,716	1,401	1,315
Total rubber	53	18,044	14,616	3,428
Miscellaneous Manufacturing Industries:				
Brooms and brushes.....	14	430	299	131
Electrical machinery	83	25,342	20,293	5,049
Instruments	8	252	203	49
Gas and electrical fixtures.....	20	6,609	3,298	3,311
Storage batteries	9	2,843	2,260	583
Dental supplies	12	192	171	21
Optical goods	17	263	231	37
Signs (non-electrical)	16	407	325	82
Toys and unclassified novelties.....	18	847	462	385
Other manufacturing plants.....	36	2,557	1,767	790
Total miscellaneous manufacturing industries....	233	39,747	29,309	10,438
Total manufacturing and mechanical industries..	2,546	286,247	230,146	56,101

TABLE 1—NUMBER OF PLANTS AND EMPLOYEES IN OHIO INDUSTRIES AND SERVICE GROUPS SURVEYED—Concluded

Industry or Service Group	Number of Plants	Number of Workers			
		Total	Male	Female	
TRANSPORTATION AND COMMUNICATION:					
Garages	209	3,061	2,786	275	
Total transportation and communication.....	209	3,061	2,786	275	
DOMESTIC AND PERSONAL SERVICE:					
Laundries	47	1,851	599	1,252	
Dry cleaning and dyeing.....	57	1,784	821	963	
Total domestic and personal service.....	104	3,635	1,420	2,215	
GRAND TOTAL	2,901	800,674	242,069	58,615	

Table 2 represents a summary of the data in Table 1 together with the 1930 United States census figures for the types of industries surveyed. The percentage of the total number of workers based on the 1930 census is given for each major industrial classification included in this survey. Thirty-one and one-tenth per cent of workers in the types of industry surveyed were included in this study, which, however, constituted only 11.5% of all gainfully employed workers in the State. It should be noted that the percentage of workers surveyed in some industries is larger than in others. This is due in part to the deliberate effort to survey a larger percentage of the more hazardous and diversified industries. In some cases, however, the percentage of workers actually surveyed according to the census shows a significant deviation from the percentage anticipated. This deviation is attributed in no small degree to employment trends of either a cyclic or long term character which rendered the 1930 census figures somewhat inaccurate as an indication of present employment.

The survey of 1.2% of workers employed in extraction of minerals, other than coal, is not a sufficient representation in this group. Fourteen mines, principally clay mines, were originally chosen in this group, but when the surveys were completed and classified it was found that they were now listed under clay, glass and stone, since the mining operations were an integral part of brick, tile, and cement manufacturing processes. It was also found that some mines were no longer operating and could not be surveyed.

TABLE 2—NUMBER AND PERCENTAGE OF WORKERS SURVEYED, BY INDUSTRY

Industry	Gainful Workers in Specified Industries Surveyed in State of Ohio		
	1930 census figures	Number surveyed	Per cent surveyed
All industries	2,615,938	300,674	11.5
All industries of types surveyed.....	967,813	300,674	31.1
Extraction of minerals.....	46,481	7,731	16.6
Coal mines	30,624	7,543	24.6
Other mines	15,857	188	1.2
Manufacturing and mechanical.....	874,936	286,247	32.7
Chemical and allied.....	36,667	14,827	40.4
Cigar and tobacco.....	8,007	2,567	32.1
Clay, glass and stone.....	52,822	20,759	39.3
Clothing	34,306	13,758	40.1
Food and allied.....	42,954	14,680	34.2
Iron and steel.....	398,078	112,447	28.2
Metal industries (except iron and steel).....	27,628	15,887	56.7
Leather	16,729	6,471	38.7
Lumber and furniture.....	29,594	8,210	27.7
Paper and printing.....	54,171	11,343	20.9
Textiles	18,903	8,007	57.6
Rubber	60,871	18,044	29.6
Miscellaneous manufacturing industries.....	99,206	89,747	40.1
Transportation and communication.....	24,947	3,061	12.3
Garages	24,947	3,061	12.3
Domestic and personal service.....	21,449	3,635	16.9
Laundries, dry cleaning and dyeing.....	21,449	3,635	16.9

Size and Distribution of Plants

Tables 3 and 4 show the distribution of plants and workers according to the size of plants, and Table 5 shows the geographical distribution of workers. In Table 3 the distribution of Ohio plants surveyed according to number of workers may be compared with the United States as a whole. A particular feature of Ohio industry is the proportionately higher number of plants employing 500 or more workers. This is not due to improper sampling, but to the preponderance of iron and steel industries as indicated by the table. It is also noted that the size of plants in the various industrial groups shows a marked variation. In Table 4 the large number of Ohio workers in plants over 500 is again emphasized. According to the survey, plants of 2,500, or more, employ 21.3% of workers as compared with 11.9% for the United States as a whole. In view of the fact that some of the States largest steel companies were not included in the sample, it is probable that the figure, 21.3%, would be even larger in a tabulation which included all industrial establishments.

It should be emphasized that 97.5% of the establishments with 49.8% of the working population employ less than 500 workers. This situation prevails in spite of the fact that Ohio shows an increased percentage of larger plants. Plants employing less than 500 workers represent 149,605 workers in 2,796 plants. The National Industrial Conference Board has shown in its study that industries employing less than 500 workers could not economically provide services comparable with that of the larger plants. It is these smaller establishments that need the assistance of a state industrial hygiene organization, a fact that will be demonstrated more fully in subsequent tables.

Ohio industries have a wide geographical distribution. Every county in the State is represented in this survey. Table 5 lists 14 counties with their principal cities, each of which have 10,000, or more, of gainfully em-

TABLE 3—PERCENTAGE DISTRIBUTION OF PLANTS ACCORDING TO NUMBER OF WORKERS

Industry	Number of plants	Percentage of Plants According to Number of Workers							
		5 to 20	21 to 50	51 to 100	101 to 250	251 to 500	501 to 1000	1001 to 2500	2501 or more
United States census †.....	107,776	*49.7	23.2	11.6	9.5	3.5	1.6	0.7	0.2
Total all industries studied.....	2,901	45.4	24.1	12.1	11.3	3.5	2.2	1.1	0.8
Extraction of minerals.....	42	23.8	16.7	11.9	19.0	14.3	14.3	....	....
Manufacturing and mechanical.....	2,546	43.0	24.5	12.6	12.4	3.7	2.2	1.8	0.4
Chemical and allied.....	196	42.9	27.6	12.8	12.2	2.6	1.0	1.0	....
Cigar and tobacco.....	21	38.1	33.1	4.8	9.5	....	4.8	4.8	....
Clay, glass and stone.....	243	37.0	25.1	17.3	14.8	2.1	2.0	0.8	....
Clothing.....	168	37.5	25.6	13.1	15.5	6.5	1.2	0.6	....
Food and allied.....	353	63.5	18.1	9.6	6.5	1.4	0.8	....	....
Iron and steel.....	615	32.0	23.4	14.6	16.9	6.3	3.3	2.3	1.1
Metal industries (except iron and steel).....	185	44.9	25.4	9.7	12.4	3.2	3.2	1.1	....
Leather.....	35	25.7	28.5	11.4	17.1	5.7	8.6	2.9	....
Lumber and furniture.....	179	57.5	24.6	8.9	6.1	0.6	2.2	....	....
Paper and printing.....	154	39.0	29.2	14.3	12.3	3.9	....	1.3	....
Textile.....	111	46.8	25.2	11.7	9.9	5.4	....	0.9	....
Rubber.....	53	24.5	31.0	11.3	15.1	7.5	1.9	3.8	1.9
Miscellaneous manufacturing.....	233	46.3	24.5	11.6	9.4	2.1	3.4	1.7	0.9
Transportation and communication.....	209	78.9	18.2	2.9	....	....	....	....	....
Garages.....	29	78.9	18.2	2.9	....	....	....	....	....
Domestic and personal service.....	101	47.1	29.8	18.3	4.8	....	....	....	....
Laundries, dry cleaning and dyeing..	101	47.1	29.8	18.3	4.8	....	....	....	....

† United States census figures for all manufacturers in United States 1929.

* 6 to 20 in United States census figures.

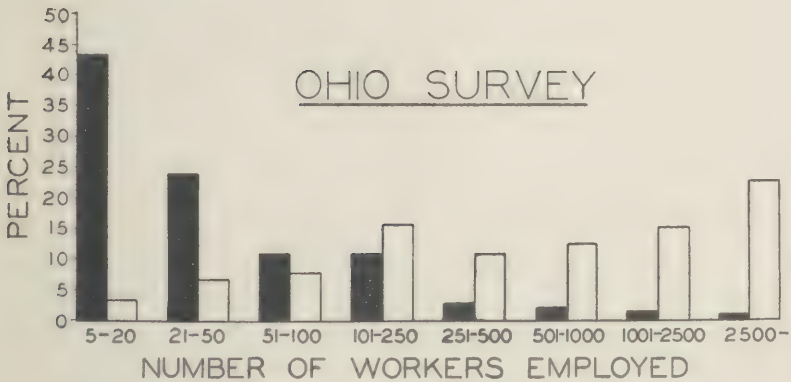
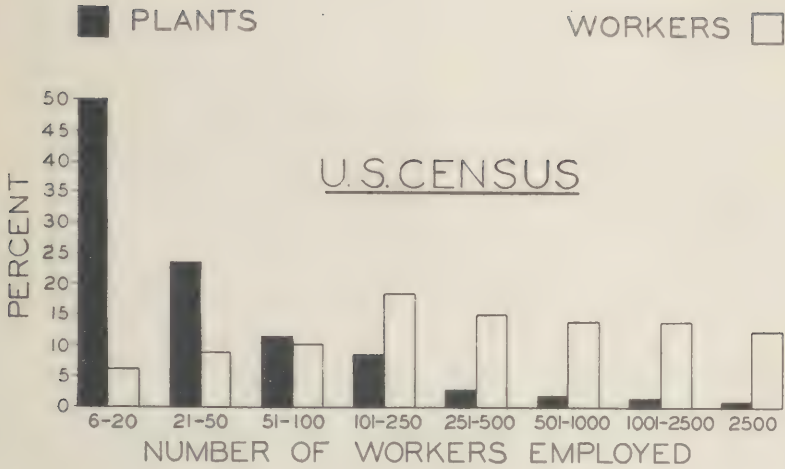
TABLE 4—PERCENTAGE DISTRIBUTION OF WORKERS ACCORDING TO SIZE OF PLANTS

Industry	Number of workers	Percentage of Plants According to Number of Workers							
		5 to 20	21 to 50	51 to 100	101 to 250	251 to 500	501 to 1000	1001 to 2500	2501 or more
United States census †.....	8,559,009	*6.9	9.5	10.4	18.6	15.6	13.7	13.4	11.9
Total all industries studied.....	300,674	4.8	7.7	8.3	17.0	12.0	13.9	15.1	21.3
Extraction of minerals.....	7,731	2.0	2.7	4.8	15.5	27.2	47.8	....	....
Manufacturing and mechanical.....	286,247	4.3	7.2	8.0	17.2	11.8	13.3	15.8	22.4
Chemical and allied.....	14,827	6.2	12.3	11.4	24.4	10.1	14.0	21.6	....
Cigar and tobacco.....	2,567	3.7	10.3	3.2	12.6	....	27.3	43.0	....
Clay, glass and stone.....	20,759	4.7	10.1	14.8	26.1	8.3	20.5	16.1	....
Clothing.....	13,758	5.4	10.0	11.0	80.0	27.4	8.8	7.5	....
Food and allied.....	14,680	16.7	14.5	17.8	24.5	13.1	14.0	....	....
Iron and steel.....	112,447	2.0	4.5	5.9	14.8	12.7	11.3	17.2	32.0
Metal industries (except iron and steel).....	15,887	6.6	9.7	8.9	22.3	14.9	22.5	15.3	....
Leather.....	6,471	1.8	5.2	2.0	16.3	17.3	41.1	16.2	....
Lumber and furniture.....	8,210	13.6	16.7	13.5	17.7	3.7	34.8	....	....
Paper and printing.....	11,343	6.3	12.5	14.0	28.3	16.9	....	22.0	....
Textile.....	8,007	7.4	11.0	11.5	21.0	27.9	....	21.1	....
Rubber.....	18,044	0.7	3.3	2.3	7.8	5.9	3.7	15.1	61.1
Miscellaneous manufacturing.....	39,747	3.0	4.6	4.7	9.2	4.5	13.3	17.6	43.0
Transportation and communication.....	3,061	50.1	37.3	12.6	....	....	....	....	....
Garages.....	3,061	50.1	37.3	12.6	....	....	....	....	....
Domestic and personal service.....	3,635	14.7	23.6	36.3	20.1	....	....	....	....
Laundries, dry cleaning and dyeing..	3,635	14.7	23.6	36.3	20.1	....	....	....	....

† United States census figures for all manufacturers in United States 1929.

* 6 to 20 in United States census figures.

ployed workers in the manufacturing and mechanical industrial groups. Moreover, these outstanding centers of industrial activity are widely scattered throughout the State. In addition to the counties listed, the establishments in the remaining 74 counties in the State employ almost as many workers as Cuyahoga County, the most populous county in the State. These figures include all gainful employment in the manufacturing and mechanical industries, but do not include employment in the extraction of minerals which is important throughout the entire southeastern part of the State. It is obvious, therefore, that Ohio is distinguished by the importance of industrial activity in all parts of the State.



PERCENTAGE DISTRIBUTION OF PLANTS AND
WORKERS IN MANUFACTURING INDUSTRIES AC-
CORDING TO THE NUMBER OF WORKERS EMPLOYED

TABLE 5—COUNTIES WITH MORE THAN 10,000 GAINFULLY EMPLOYED WORKERS IN MANUFACTURING AND MECHANICAL INDUSTRIES¹

County (With Principal Cities)	Number of workers
All counties	848,947
Cuyahoga (Cleveland)	182,912
Hamilton (Cincinnati)	99,347
Summit (Akron)	68,182
Lucas (Toledo)	53,885
Montgomery (Dayton)	52,970
Stark (Canton-Massillon-Alliance)	41,049
Mahoning (Youngstown)	39,798
Franklin (Columbus)	35,585
Trumbull (Warren-Youngstown suburbs)	28,020
Butler (Hamilton-Middletown)	21,13E
Lorain (Lorain-Elyria)	18,448
Clark (Springfield)	17,189
Jefferson (Steubenville)	12,493
Scioto (Portsmouth)	11,451
Remaining 74 counties	171,483

¹ Compiled from the statistics of the Ohio Department of Industrial Relations, complete as of January 1, 1937.

Industrial Welfare Provisions

The promotion of adequate industrial welfare facilities may properly be considered an essential part of a state industrial hygiene program. Industries which have been leaders in the promotion of safety, the provision of medical facilities, etc., are invariably the most willing to co-operate in the elimination of occupational disease hazards. Tables 6, 7 and 8 show the types of facilities available to Ohio workers. The data are arranged to show the activities of the various major industrial groups in relation to each other and to industry as a whole. In Table 9 the comparisons of facilities between the small and large plants are made for Ohio industry as a whole, while Table 10 compares Ohio data with that of other states.

Safety Organization:

Table 6 shows the percentage of workers for whom the various safety services are available. In order to comprehend more clearly the significance of these services, a portion of the Field Surveyors Manual relating to the various welfare facilities is quoted as follows:

"Full-time"—By "full-time" is meant that a person spends more than one-half of his work day every day in the specified activity while the plant is in operation. This applies to safety director, physician and nurse below.

"Safety director"—A person of special training or ability acquired from experience, who is employed or designated from the plant personnel, to study and improve conditions for the prevention of accidents.

"Shop committees"—Committees made up of employees from various departments, or from the plant at large, designated to have certain responsibilities for accident prevention.

"Insurance service"—Applies to the use of safety service rendered by an insurance company, such as posters, periodic inspections, etc.

"Others"—Any other special provisions or arrangements designed to prevent accidents, such as membership in National Safety Council."

It will be noted that the rubber industries rank far ahead of all other industrial groups when all those services are considered. Other miscellaneous manufacturing, which includes electrical machinery, follows in second place, with iron and steel third. Chemical and allied industries and the clay, glass and stone industries follow in fourth and fifth place. All the above named industries have a substantial percentage of large plants and are characterized by the existence of many accident hazards as well as occupational disease exposures. Therefore, it is not surprising to find them ranking high in safety facilities.

TABLE 6—INDUSTRIAL WELFARE PROVISIONS (ALL PLANTS SURVEYED) — SAFETY ORGANIZATION

Industry or Service Group	Number of plants	Number of workers	Percentage of Workers to Whom Service Is Available				
			Safety director		Shop committees	Insurance	Other safety activities
			Full time	Part time			
All industries	2,901	300,674	37.8	24.2	48.2	64.4	25.1
Extraction of minerals.....	42	7,731	55.8	26.0	96.8	99.5	0.2
Manufacturing and mechanical....	2,546	286,247	38.2	24.8	48.0	64.5	26.2
Chemical and allied.....	196	14,827	32.8	24.0	32.8	47.5	29.9
Cigar and tobacco.....	21	2,567	27.3	42.9	27.3	55.1	5.1
Clay, glass and stone.....	243	20,759	23.4	23.1	33.0	72.8	14.9
Clothing	168	13,758	2.4	5.2	23.4	37.3	9.4
Food and allied.....	353	14,680	23.4	8.5	35.8	40.1	19.7
Iron and steel.....	615	112,447	49.3	22.1	56.1	68.9	31.0
Metal industries (except iron and steel)	185	15,337	9.8	36.8	33.6	52.9	18.9
Leather	35	6,471	6.2	24.0	19.9	75.4	17.1
Lumber and furniture.....	179	8,210	27.3	6.9	20.6	49.8	4.7
Paper and printing.....	154	11,343	30.2	9.9	43.4	54.0	22.6
Textile	111	8,007	8.8	21.1	14.1	33.3	15.1
Rubber	53	18,044	81.3	3.0	67.7	96.3	78.1
Miscellaneous manufacturing industries	233	39,747	41.9	58.9	67.8	72.7	16.1
Transportation and communication	209	3,061	.....	.....	1.5	16.1	8.0
Garages	209	3,061	.....	.....	1.5	16.1	8.0
Domestic and personal service....	104	3,635	2.4	1.0	5.7	24.2	10.2
Laundries, dry cleaning and dyeing	104	3,635	2.4	1.0	5.7	24.2	10.2

Medical Provisions:

Table 7 shows the percentage of workers provided with various types of medical facilities. The definitions pertaining to medical facilities are quoted from the Field Surveyors Manual as follows:

"Hospital"—May be company owned, located at, or convenient to the plant. A hospital is defined as a place located on the company grounds where the patient may be kept overnight or for duration of illness with adequate medical attention.

If neither is available, none should be checked.

"First-aid room"—A room set aside and equipped for this and no other purpose.

"First-aid kit"—An adequate first-aid kit should contain all items necessary in rendering first aid in cases of accident or sudden illness.

"Trained first-aid workers"—May or may not refer to a full-time worker depending upon the size of the plant, but does mean a certified first-aid worker who is always present in the plant and available to render this service while the plant is in operation.

"Physician"—Refers to a full-time or part-time physician employed or retained by the company officials to render medical service in case of accident or illness of employes, conduct physical examinations and carry out other medical service.

"On call"—This is self-explanatory.

"Nurse"—To render nursing service on a full-time or part-time basis."

In the provisions of medical service as in safety services, the rubber industry again ranks far above all other industries with miscellaneous manufacturing in second place. Iron and steel ranks third with tobacco in fourth place. The high ranking of tobacco may be explained by the large percentage of workers employed in a single large tobacco factory which has excellent medical provisions. The chemical and allied industries rank fifth in this group.

Disability Statistics:

Table 8 indicates the extent to which Ohio industries keep disability statistics. The items in this group are defined in the Field Surveyors Manual as follows:

"Sick benefit organization"—A fund or insurance maintained by either employers or employees, or both, to provide payments to employees during periods of disability from sickness or non-industrial accidents.

TABLE 7 — INDUSTRIAL WELFARE PROVISIONS (ALL PLANTS SURVEYED) — MEDICAL PROVISIONS

Industry or Service Group	Number of plants	Number of workers	Percentage of Workers to Whom Service Is Available											
			Hos- pital	First- aid room	First- aid kit	Trained first- aid worker	Physician			Nurse				
							Full time	Part time	On call	Full time	Part time	Public health	Other	
All industries	2,901	300,674	18.5	55.1	90.1	51.8	22.1	27.8	49.4	43.1	1.9	1.0	38.3	8.4
Extraction of minerals.....	42	7,731	....	29.5	90.8	84.8	....	....	99.3	....	....	....	....	....
Manufacturing and mechanical.....	2,546	286,247	19.4	57.1	90.1	52.0	23.3	29.2	47.8	45.3	2.0	1.0	40.2	8.8
Chemical and allied.....	186	14,827	19.9	59.0	94.1	53.7	21.6	18.8	43.6	36.8	....	5.1	32.5	9.7
Cigar and tobacco.....	21	2,567	....	75.3	96.3	75.5	....	....	91.5	42.9	....	....	42.9	42.9
Clay, glass and stone.....	243	20,769	12.1	48.9	96.3	42.7	....	9.9	69.6	24.3	....	....	24.3	0.2
Clothing	168	13,738	1.0	84.8	89.3	31.4	....	....	83.3	8.1	8.6	....	8.1	....
Food and allied.....	383	14,680	2.7	24.0	91.8	35.2	6.8	1.4	64.5	11.2	6.0	....	11.2	....
Iron and steel.....	635	112,447	13.5	70.2	96.8	54.0	30.4	28.3	41.1	57.1	0.9	....	49.8	16.5
Metal industries (except iron and steel)	185	15,387	2.7	48.6	83.4	49.6	....	36.2	53.6	23.8	1.1	....	16.9	7.8
Leather	35	6,471	....	63.6	98.3	24.7	....	6.2	82.5	14.0	13.7	....	26.0	....
Lumber and furniture.....	179	8,210	10.2	41.5	94.2	38.2	....	22.9	52.7	28.5	1.3	....	28.5	0.9
Paper and printing.....	164	11,343	15.2	32.1	92.9	38.2	....	30.9	57.9	24.3	1.9	....	22.4	4.9
Textile	111	8,007	2.0	44.5	90.1	49.6	....	10.0	79.2	5.9	1.0	1.3	4.1	....
Rubber	53	18,044	67.1	84.9	97.2	85.3	61.1	67.1	29.4	80.0	2.9	1.5	77.7	3.7
Miscellaneous manufacturing industries	233	30,747	48.2	44.5	62.4	60.0	43.1	56.6	25.7	66.6	1.6	4.7	55.3	4.1
Transportation and communication.....	209	8,061	....	....	82.0	5.7	....	....	46.7	....	0.8	....	....	....
Garages	209	3,061	....	....	82.0	5.7	....	....	46.7	....	0.8	....	....	....
Domestic and personal service.....	104	3,635	....	2.4	75.2	8.6	....	1.9	68.0	....	0.6	....	0.3	....
Laundries, dry cleaning and dyeing..	104	3,635	....	2.4	75.2	8.6	....	1.9	68.0	....	0.6	....	0.3	....

"Sickness records"—State whether the company maintains such records for each case of disability through a sickness, and how long a period of absence or waiting period must elapse before sickness records are made.

"Accident record"—States if records for lost time due to accidents are kept."

Rubber continues to lead all industrial groups as before, with other miscellaneous manufacturing and iron and steel in second and third places, respectively. It is noted, however, that leather and paper appear in fourth and fifth places, respectively; with other metals; chemical and allied industries; and clay, glass and stone very close behind.

TABLE 8—INDUSTRIAL WELFARE PROVISIONS (ALL PLANTS SURVEYED)—DISABILITY STATISTICS

Industry or Service Group	Number of plants	Number of workers	Percentage of Workers to Whom Indicated Facility Is Available		
			Sick-benefit association	Sickness records	Accident records
All industries	2,901	300,674	43.9	49.8	87.2
Extraction of minerals.....	42	7,781	5.2	5.2	90.2
Manufacturing and mechanical.....	2,546	236,247	45.8	51.9	87.6
Chemical and allied.....	196	14,827	39.0	45.2	82.5
Cigar and tobacco.....	21	2,567	0.2	27.5	85.7
Clay, glass and stone.....	243	20,759	31.9	47.3	86.0
Clothing	168	13,758	16.6	21.9	69.6
Food and allied.....	353	14,680	29.4	25.7	73.7
Iron and steel.....	615	112,447	53.7	51.8	93.0
Metal industries (except iron and steel)...	185	15,387	32.7	49.0	87.0
Leather	85	6,471	53.1	50.5	73.7
Lumber and furniture.....	179	8,210	33.3	36.7	74.5
Paper and printing...;	154	11,343	32.5	53.7	83.1
Textile	111	8,007	34.6	35.1	75.0
Rubber	53	18,044	68.6	84.6	97.9
Miscellaneous manufacturing industries.....	233	39,747	53.8	71.4	83.5
Transportation and communication.....	209	3,061	3.4	5.7	46.7
Garages	209	3,061	3.4	5.7	46.7
Domestic and personal service.....	104	3,635	10.4	14.8	84.1
Laundries, dry cleaning and dyeing.....	104	3,635	10.4	14.8	84.1

Comparison of Large and Small Plants

Table 9 compares the combined welfare facilities in plants with 100, or more, workers with those employing less than 100 workers. The larger plants show a striking superiority in all welfare provisions except first-aid kits and physicians on call. Large plants sometimes discourage the use of first-aid kits which encourages workers with minor injuries to treat themselves rather than to avail themselves of hospital facilities. This accounts for what might otherwise be considered a neglect on the part of the larger industrial group. It is readily understood that a physician on call is the only economical solution to the question of medical service for most smaller plants. Therefore, it is not surprising to note the considerable recourse to the "physician on call" in the smaller plants. The larger plants are generally served by full and part-time physicians. Since the extent of provisions of welfare facilities by establishments is in general indicative of their relative ability to cope with industrial health hazards and generally in direct proportion to size, it is evident that a primary concern of State Industrial Hygiene Organization is the assistance of the smaller industries in their control of occupational disease.

TABLE 9—INDUSTRIAL WELFARE SERVICE IN PLANTS WITH 100 OR MORE WORKERS AS COMPARED WITH PLANTS HAVING LESS THAN 100 WORKERS—OHIO SURVEY, VIRGINIA SURVEY AND MARYLAND SURVEY

Kind of Service	Percentage of Workers With Listed Service— Plants With—					
	Ohio		Virginia		Maryland	
	100 or more workers	Less than 100 workers	100 or more workers	Less than 100 workers	100 or more workers	Less than 100 workers
SAFETY PROVISIONS						
Safety director:						
Part-time	24.9	21.7	31.6	10.6	25.0	4.0
Full-time	47.3	1.1	21.8	0.6	46.2	2.9
Shop committees	58.6	8.3	72.7	13.2	72.1	7.4
Insurance	72.3	34.3	99.6	95.2	98.8	93.8
Other	29.0	10.2	86.0	57.8	65.9	18.3
MEDICAL PROVISIONS						
Hospital	23.2	0.3	21.0	0.8	32.1	0.2
First-aid room	63.0	5.5	60.2	5.9	67.0	10.5
First-aid kit	90.3	89.6	98.6	93.0	99.2	91.7
Trained first-aid worker	64.3	4.1	73.4	27.4	76.9	18.5
Plant physician:						
Part-time	34.9	0.7	30.5	4.8	42.0	44.3
Full-time	27.9	0.1	25.3	2.1	38.2	0.6
On call	45.7	63.5	(a)	(a)	(a)	(a)
Plant nurse:						
Part-time	2.2	0.6	2.4	.....	.....	0.02
Full-time	54.2	0.2	37.5	0.8	50.1	0.43
Public health	1.2	.....	(a)	(a)	(a)	(a)
Registered	48.2	0.1	(a)	(a)	(a)	(a)
Other	10.5	0.5	(a)	(a)	(a)	(a)
DISABILITY STATISTICS						
Sick-benefit association	53.2	8.3	39.8	14.9	57.6	3.1
Sickness records	60.0	10.8	40.1	8.5	65.4	10.1
Accident records	93.0	64.6	99.8	93.1	98.7	89.7

(a) Data not available.

Comparison of Ohio with Other States

Table 10 compares industrial welfare facilities in Ohio with similar data from other states. There is noted a general agreement among the several states with minor exceptions. Some of these differences are doubtless real and others may be attributed to different interpretation of various items. Some differences would be expected since the size, distribution, dominant types of industry, and state laws necessarily govern the type of welfare facilities provided. Particular attention should be called to the fact that accident records are available in 100% of all cases where compensation is requested, since the Ohio Industrial Commission requires the certification of all claims where State Compensation Insurance is paid. The 87.2% indicated in Table 10 under Ohio accident records indicates those industries that keep in their own possession permanent accident records in some kind of book form.

TABLE 10—COMPARISON OF INDUSTRIAL HEALTH SERVICES IN OHIO INDUSTRIES WITH SIMILAR DATA FROM FIVE OTHER STATES AND A TYPICAL INDUSTRIAL AREA

Kind of Service	Ohio	Idaho	Utah	Virginia	South Carolina	Maryland	Typical industrial area
SAFETY PROVISIONS							
Safety director:							
Part-time	24.2	85.5	17.4	27.6	4.1	20.8	21.0
Full-time	37.8	6.3	38.8	17.8	.....	37.6	23.8
Shop committees	48.2	24.7	46.3	61.5	55.7	59.3	83.6
MEDICAL PROVISIONS							
Hospital	18.5	10.1	25.5	17.2	(a)	25.8	(a)
First-aid room	55.1	31.0	62.2	50.0	35.0	55.8	48.5
First-aid kit	90.1	96.8	90.6	97.5	67.3	97.7	(a)
Trained first-aid worker.....	51.8	58.8	72.6	64.7	(a)	65.4	(a)
Plant physician:							
Part-time	27.8	17.7	19.0	25.6	24.2	42.4	17.8
Full-time	22.1	10.0	30.5	21.0	.....	30.7	15.3
Plant nurse:							
Part-time	1.9	0.1	4.9	1.9	3.7	.....	2.7
Full-time	43.1	16.8	25.2	30.6	23.8	40.3	34.1
DISABILITY STATISTICS							
Sick-benefit association	43.9	36.0	64.6	35.1	(a)	47.8	29.4
Sickness records	49.8	38.5	65.3	34.1	26.8	54.5	40.0
Accident records	87.2	99.8	98.9	98.5	98.2	96.9	98.1

(a) Data not available.

MATERIAL EXPOSURES BY OCCUPATION AND THEIR CONTROLS

The primary objective of this survey was the determination of the exposures of workmen to harmful materials incidental to industrial processes. More than 500 such materials have been catalogued. Others, although not harmful under ordinary circumstances, may be inimical to the workers' health under conditions prevailing in the industrial environment. It is also known that degrees of exposures harmful to certain workers may be tolerated by other individuals working under practically identical environmental conditions. From time to time threshold limits have been proposed for some of the more dangerous materials below which it is presumed that the liability of injury to any worker is negligible. *This bulletin, however, makes no attempt to evaluate the extent of the exposure to any material listed, but indicates only that the worker is employed in an environment where such substances are used or created.*

The material exposures indicated in the following tables might be either potential hazards or actual hazards. A potential hazard is a latent hazard that exists in possibility and not necessarily in actuality. For example, a workman handling benzol is exposed to the potential hazard of breathing benzol fumes, and the hazard would become an actual one if and when benzol should leak out of the containers or be drawn from them and allowed to stand in open containers. Direct exposure to an actual hazard constitutes an imminent danger of injury to the worker. The differentiation between potential and actual hazards can be accomplished only by the application of precise engineering and chemical determinations and is outside the scope of the survey.

The number of materials encountered in this survey was too great to permit separate listing of all. It was necessary, therefore, to classify all these substances into 50 material groups which are listed in the appendix of this report. Thus, for example, the group, silicate dust, includes talc, feldspar, clay, slag, Portland cement, and others; and the group, halogenated hydrocarbons, includes carbon tetrachloride, ethyl bromide, picron, freon, ethylene dichloride, and others. This scheme of classification with certain modifications was the one recommended by the United States Public Health Service as found in Public Health Bulletin 236. It is also employed by other health departments engaged in similar surveys.

Exposures to specified materials are presented both in summarized forms as in Tables II and IIA and in detailed form in the exposure by occupation tables for each of 93 industrial subdivisions.

Table II indicates the total number and percentage of workers exposed to specified materials listed in order of their incidence. It also indicates the number and percentage of exposed workers for each major industrial classification. The percentage of total exposures to specified materials occurring in each major industrial classification is listed in IIA. For example, there is a total of 1,110 workers exposed to halogenated hydrocarbons. Of this number 98, or 8.6%, are found in the chemical and allied industry; 11, or 1.0%, in the clothing industry; 68, or 6.1%, in iron and steel, etc. Table II indicates the importance of a specified material from the point of view within a particular industry. This answers the question, "How prevalent is an exposure within a given industry?" The second table indicates the importance of the exposure in relation of one industry to another or more explicitly "Where does a given exposure occur?"

CONTROL MEASURES

The ideal solution of the problem created by an industrial hazard is the substitution of a harmless material for an injurious one. In many instances this is obviously impossible. In such cases, the proper procedure is the institution of suitable control measures to minimize possible danger to the workers. Various types of controls can be, and, are used, depending upon the circumstances and materials encountered. The following control measures with their explanations were listed in the Field Surveyors Manual and were used as a guide by the surveyors in this study:

- "A. Positive: Positive ventilation refers to supply type in which air is *forced* into the room. At least part of the air must be fresh air from an outside source.
- B. Negative: Negative ventilation refers to exhaust methods of removing air from a room.
- C. Local Exhaust: This type of ventilation refers to provisions for ventilating a particular section of the workroom; for example, an exhaust system attached to tool grinders, etc., and should not be confused with general exhaust which serves the entire workroom. One room may be equipped with a general and several local exhaust systems.
- D. Enclosure: This refers to control measures consisting of a process in a total enclosure; for example, sand blasting cabinets which are relatively small box-like enclosures in

TABLE 11—TOTAL EXPOSURES TO SPECIFIED MATERIALS

NUMBER AND PERCENTAGE OF WORKERS EXPOSED TO SPECIFIED MATERIALS IN EACH INDUSTRIAL CLASSIFICATION																																		
Materials	All surveyed industries		Extraction of minerals		Chemical and allied		Cigar and tobacco		Clay, glass and stone		Clothing		Food and allied		Iron and steel		Metal industries (except iron and steel)		Leather		Lumber and furniture		Paper and printing		Textile		Rubber		Miscellaneous manufacturing		Transportation and communication		Domestic and personal service	
Number of workers in surveyed plants	800,674		7,781		14,827		2,567		20,759		18,758		14,680		112,447		15,887		6,471		8,210		11,848		8,007		18,044		39,747		3,061		3,635	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Other metals	61,420	20.4	18	0.2	1,546	10.4	17	0.7	1,507	7.3	47	0.3	164	1.1	40,180	35.7	6,132	39.9	56	0.9	564	6.9	759	6.7	67	0.8	2,088	11.3	7,670	19.3	653	21.3	2	0.1
Carbon monoxide	46,043	15.3	4,467	57.8	1,487	10.0	10	0.4	3,793	18.3	220	1.6	1,673	11.4	23,513	20.9	2,597	16.9	97	1.5	483	5.9	505	4.5	119	1.5	446	2.5	4,770	12.0	1,741	56.9	117	3.2
Silicate dusts	45,748	15.2	6,732	87.1	1,210	8.2	1	0.0	10,472	50.4	12	0.1	110	0.7	16,363	14.6	4,007	26.0	4	0.1	174	2.1	364	3.2	77	1.0	3,751	20.8	2,246	5.7	224	7.3	1	0.0
Other gases	43,382	14.4	4,645	60.1	1,986	13.4	13	0.5	2,598	12.5	194	1.4	1,784	12.2	22,163	19.7	2,295	14.9	143	2.2	414	5.0	483	4.3	90	1.1	690	3.5	5,454	13.7	348	11.4	142	3.9
Petroleum products	37,865	12.6	650	8.4	1,702	11.5	38	1.5	929	4.5	121	0.9	645	4.4	21,575	19.2	1,916	12.5	79	1.2	319	3.9	1,713	15.1	376	4.7	1,324	7.3	5,146	12.9	1,278	41.8	54	1.5
Silica dust	31,093	10.3	4,510	58.3	457	3.1	5	0.2	9,010	43.4	33	0.2	13	0.1	11,665	10.4	3,407	22.1	64	1.0	553	6.7	37	0.3	8	0.1	66	0.4	1,232	3.1	34	1.1	.....	.....
Organic dusts	25,701	8.5	26	0.3	2,192	14.8	2,289	89.2	578	2.8	2,225	16.2	2,415	16.5	3,548	3.2	795	5.2	602	9.3	2,542	31.0	1,047	9.2	2,202	27.5	2,932	16.2	2,267	5.7	15	0.5	26	0.7
Non-silicious dusts	19,124	6.4	1,179	15.3	1,472	9.9	17	0.7	1,899	9.1	37	0.3	49	0.3	8,653	7.7	1,653	10.8	90	1.4	298	3.6	129	1.1	51	0.6	1,590	8.8	1,723	4.3	287	9.4	2	0.1
Temperature change	15,656	5.2	.....	.....	7	0.0	.....	.....	1,417	6.8	.....	.....	.....	.....	13,158	11.7	872	5.7	.....	.....	9	0.1	.....	.....	.....	.....	.....	.....	193	0.5	.....	.....	.....	.....
Coal dust (bituminous)	14,470	4.8	7,305	94.5	997	6.7	6	0.3	1,210	5.8	20	0.1	319	2.2	3,590	3.2	193	1.3	26	0.4	110	1.3	112	1.0	87	1.1	155	0.9	245	0.6	9	0.3	81	2.2
Lead and its compounds	12,865	4.3	31	0.4	809	5.5	.....	.....	1,517	7.3	13	0.1	86	0.6	3,017	2.7	2,321	15.1	4	0.1	182	2.2	954	8.4	23	0.3	1,045	5.8	2,652	6.7	206	6.7	.....	.....
Alkaline compounds	10,189	3.4	1	0.0	2,329	15.7	4	0.2	764	3.7	28	0.2	570	3.9	2,754	2.4	444	2.9	81	1.3	25	0.3	261	2.3	197	2.5	1,290	6.8	990	2.5	228	7.4	283	7.8
Organic solvents	10,046	3.3	1	0.0	1,160	7.8	72	2.8	365	1.8	33	0.2	90	0.6	794	0.7	104	0.7	699	10.8	281	3.4	1,233	11.8	83	1.0	3,478	19.3	793	2.0	575	18.8	236	6.5
Dematitis producers	8,827	2.9	7	0.1	1,106	7.5	76	3.0	65	0.3	30	0.2	3,504	23.9	667	0.6	253	1.6	824	12.7	717	8.7	902	8.0	17	0.2	268	1.5	386	1.0	.....	.....	6	0.1
Core gases	8,391	2.8	.....	.....	.....	.....	.....	.....	18	0.1	.....	.....	.....	.....	6,416	5.7	1,693	11.0	.....	.....	30	0.4	.....	.....	.....	.....	.....	.....	239	0.6	.....	.....	.....	.....
Oils, fats and waxes	6,878	2.3	76	1.0	1,285	8.7	.....	.....	155	0.7	14	0.1	473	3.2	1,584	1.4	602	4.8	191	3.0	152	1.9	151	1.3	321	4.0	751	4.2	1,000	2.5	61	2.0	2	0.1
Mineral acids	5,803	1.9	7	0.1	787	5.3	.....	.....	99	0.5	8	0.1	105	0.7	2,488	2.2	539	3.5	4	0.1	59	0.7	238	2.1	92	1.1	231	1.3	1,049	2.6	83	2.7	14	0.4
Paints and enamels	5,225	1.8	8	0.1	575	3.9	.....	.....	558	2.7	6	0.0	62	0.4	1,982	1.8	213	1.4	17	0.3	401	4.9	70	0.6	149	1.9	216	1.2	795	2.0	233	7.6	.....	.....
Lacquers and varnishes	4,553	1.5	.....	.....	487	3.3	.....	.....	339	1.6	15	0.1	19	0.1	1,125	1.0	321	2.1	71	1.1	577	7.0	133	1.2	116	1.4	126	0.7	956	2.4	268	8.8	.....	.....
Inks	4,064	1.4	.....	.....	340	2.3	.....	.....	25	0.1	43	0.3	73	0.5	206	0.2	72	0.5	113	1.8	86	1.0	2,347	20.7	152	1.9	225	0.6	.....	.....	.....	.....	36	1.0
Salts	4,036	1.3	.....	.....	2,305	15.5	1	0.0	123	0.6	8	0.1	386	2.6	443	0.4	331	2.2	35	0.6	7	0.1	123	1.1	31	0.4	33	0.2	185	0.5	.....	.....	12	0.3
Other chemicals	2,529	0.8	2	0.0	936	6.3	.....	.....	58	0.3	.....	.....	88	0.6	692	0.6	150	1.0	.....	.....	1	0.0	213	1.9	17	0.2	163	0.9	211	0.5	.....	.....	3	0.1
Sulfur	2,131	0.7	121	1.6	692	4.7	.....	.....	47	0.2	.....	.....	9	0.1	33	0.0	10	0.1	.....	.....	.....	.....	1	0.0	15	0.2	1,141	6.3	62	0.2	.....	.....	.....	.....
Dyes	1,876	0.6	.....	.....	667	4.5	.....	.....	8	0.0	11	0.1	23	0.2	40	0.0	4	0.0	100	1.5	153	1.9	266	2.3	342	4.3	179	1.0	55	0.1	.....	.....	23	0.8
Benzol	1,873	0.6	.....	.....	214	1.4	.....	.....	11	0.1	.....	.....	.....	.....	62	0.1	17	0.1	64	1.0	5	0.1	285	2.5	7	0.1	392	2.2	773	1.9	4	0.1	39	1.1
Antimony and its compounds ..	1,863	0.6	.....	.....	562	3.8	.....	.....	46	0.2	.....	.....	.....	.....	155	0.1	72	0.5	.....	.....	6	0.1	1	0.0	.....	.....	548	3.0	478	1.2	.....	.....	.....	.....
Alcohols, esters and ethers	1,795	0.6	.....	.....	334	2.3	7	0.3	84	0.2	2	0.0	379	2.6	144	0.1	5	0.0	103	1.6	73	0.9	30	0.3	60	0.7	218	1.2	310	0.8	1	0.0	95	2.6
Chromium and its compounds ..	1,735	0.6	.....	.....	748	5.0	.....	.....	119	0.6	.....	.....	.....	.....	175	0.2	401	2.6	.....	.....	32	0.4	24	0.2	13	0.2	2	0.0	221	0.6	.....	.....	.....	.....
Coal tar products	1,662	0.5	.....	.....	606	4.1	.....	.....	120	0.6	1	0.0	.....	.....	332	0.3	4	0.0	.....	.....	7	0.1	21	0.2	1	0.0	19	0.1	532	1.3	.....	.....	9	0.2
Halogenated hydrocarbons	1,110	0.4	.....	.....	96	0.6	.....	.....	.....	.....	11	0.1	.....	.....	68	0.1	24	0.2	4	0.1	2	0.0	195	1.7	16	0.2	279	1.5	827	0.8	6	0.2	82	2.3
Infections	1,104	0.4	.....	.....	106	0.7	.....	.....	23	0.1	.....	.....	669	4.6	.....	.....	.....	.....	180	2.8	.....	.....	.....	td										

TABLE 11a—TOTAL EXPOSURES TO SPECIFIED MATERIALS

Materials	Total number workers exposed to specified materials in plants surveyed	NUMBER OF EXPOSURES AND PERCENTAGE OF TOTAL EXPOSURES TO SPECIFIED MATERIALS IN EACH INDUSTRIAL CLASSIFICATION																															
		Extraction of minerals		Chemical and allied		Cigar and tobacco		Clay, glass and stone		Clothing		Food and allied		Iron and steel		Metal industries (except iron and steel)		Leather		Lumber and furniture		Paper and printing		Textile		Rubber		Miscellaneous manufacturing		Transportation and communication		Domestic and personal service	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Other metals	61,420	18	0.0	1,546	2.5	17	0.0	1,507	2.5	47	0.1	164	0.3	40,180	65.4	6,132	10.0	56	0.1	564	0.9	759	1.2	67	0.1	2,038	3.3	7,670	12.5	653	1.1	2	0.0
Carbon monoxide	46,048	4,467	9.7	1,487	3.2	10	0.0	3,793	8.2	220	0.5	1,673	3.6	23,513	51.1	2,597	5.6	97	0.2	488	1.1	505	1.1	119	0.3	446	1.0	4,770	10.4	1,741	3.8	117	0.3
Silicate dusts	45,748	6,732	14.7	1,210	2.6	1	0.0	10,472	22.9	12	0.0	110	0.2	16,363	35.8	4,007	8.8	4	0.0	174	0.4	364	0.8	77	0.2	2,751	8.2	2,246	4.9	224	0.5	1	0.0
Other gases	43,382	4,645	10.7	1,986	4.6	13	0.0	2,598	6.0	194	0.4	1,784	4.1	22,163	51.1	2,295	5.3	143	0.3	414	1.0	483	1.1	90	0.2	630	1.5	5,454	12.6	348	0.8	142	0.3
Petroleum products	37,865	650	1.7	1,702	4.5	38	0.1	929	2.5	121	0.3	646	1.7	21,676	57.0	1,916	5.1	79	0.2	319	0.8	1,713	4.5	376	1.0	1,324	3.5	5,146	13.6	1,278	3.4	54	0.1
Silica dust	31,003	4,510	14.5	457	1.5	5	0.0	9,010	29.0	33	0.1	13	0.0	11,065	37.5	3,407	11.0	64	0.2	553	1.8	87	0.1	8	0.0	65	0.2	1,232	4.0	34	0.1	.....	....
Organic dusts	25,701	26	0.1	2,192	8.5	2,289	8.9	578	2.2	2,225	8.7	2,415	9.4	3,543	13.8	795	3.1	602	2.3	2,542	9.9	1,047	4.1	2,202	8.6	2,932	11.4	2,267	8.8	15	0.1	26	0.1
Nonsilicious dusts	19,124	1,179	6.2	1,472	7.7	17	0.1	1,899	9.9	37	0.2	49	0.3	8,653	45.2	1,658	8.7	90	0.5	298	1.6	129	0.7	51	0.3	1,580	8.3	1,723	9.0	287	1.5	2	0.0
Temperature change	15,656	.....	.....	7	0.0	.....	.....	1,417	9.1	.....	.....	.....	.....	13,158	84.0	872	5.6	.....	.....	9	0.1	.....	.....	.....	.....	193	1.2	.....	.....	.....	.....	.....	....
Coal dust (bituminous).....	14,470	7,305	50.5	997	6.9	6	0.0	1,210	8.4	20	0.1	319	2.2	3,590	24.8	198	1.4	26	0.2	110	0.8	112	0.8	87	0.6	155	1.1	245	1.7	9	0.1	51	0.6
Lead and its compounds.....	12,865	31	0.2	809	6.3	.....	....	1,517	11.8	13	0.1	86	0.7	3,017	23.5	2,321	18.0	4	0.0	182	1.4	954	7.4	28	0.2	1,045	8.1	2,652	20.6	206	1.6	.....	....
Alkaline compounds	10,189	1	0.0	2,329	22.9	4	0.0	764	7.5	28	0.8	570	5.6	2,754	27.0	444	4.4	81	0.8	25	0.2	261	2.6	197	1.9	1,230	12.1	990	9.7	223	2.2	233	2.3
Organic solvents	10,046	1	0.0	1,160	11.5	72	0.7	365	3.6	33	0.3	90	0.9	794	7.9	104	1.0	699	7.0	281	2.3	1,282	12.3	83	0.8	3,473	34.6	793	7.9	575	5.7	236	2.3
Dermatitis producers.....	8,827	7	0.1	1,106	12.5	76	0.9	65	0.7	30	0.3	3,504	39.7	667	7.6	253	2.9	824	9.8	717	8.1	902	10.2	17	0.2	268	3.0	386	4.4	.....	.....	5	0.1
Core gases	8,391	.....	.....	.....	.....	.....	.....	13	0.2	.....	.....	.....	.....	6,416	76.5	1,693	20.2	.....	.....	30	0.4	.....	.....	.....	.....	239	2.8	.....	.....	.....	.....	.....	....
Oils, fats and waxes.....	6,878	76	1.1	1,285	18.7	.....	.....	155	2.3	14	0.2	473	6.9	1,584	23.0	662	9.6	191	2.8	152	2.2	151	2.2	321	4.7	751	10.9	1,000	14.5	61	0.9	2	0.0
Mineral acids	5,803	7	0.1	787	13.6	.....	.....	99	1.7	8	0.1	105	1.8	2,488	42.9	539	9.3	4	0.1	59	1.0	238	4.1	92	1.6	231	4.0	1,049	18.1	83	1.4	14	0.2
Paints and enamels.....	5,285	8	0.2	575	10.9	.....	.....	558	10.6	6	0.1	62	1.2	1,982	37.5	213	4.0	17	0.3	401	7.6	70	1.3	149	2.8	216	4.1	795	15.0	233	4.4	.....	.....
Lacquers and varnishes.....	4,553	.....	.....	487	10.7	.....	.....	339	7.4	15	0.3	19	0.4	1,125	24.7	321	7.1	71	1.6	577	12.7	133	2.9	116	2.5	126	2.8	956	21.0	263	5.9	.....	.....
Inks	4,064	.....	.....	340	8.3	.....	.....	28	0.7	43	1.1	73	1.8	206	5.0	72	1.8	113	2.9	86	2.1	2,347	57.5	152	3.7	353	8.8	225	5.5	.....	.....	36	0.9
Salts	4,036	.....	.....	2,305	57.1	1	0.0	123	3.2	8	0.2	386	9.6	443	11.0	331	8.2	33	0.9	7	0.2	123	3.0	31	0.8	38	0.9	185	4.6	.....	.....	12	0.3
Other chemicals	2,529	2	0.1	986	37.0	.....	.....	58	2.3	.....	.....	83	3.3	692	27.4	150	5.9	.....	.....	1	0.0	213	8.4	17	0.7	163	6.4	211	8.3	.....	.....	3	0.1
Sulfur	2,131	121	5.7	692	32.5	.....	.....	47	2.2	.....	.....	9	0.4	33	1.5	10	0.5	.....	.....	.....	.....	1	0.0	15	0.7	1,141	53.5	62	2.9	.....	.....	.....	.....
Dyes	1,876	.....	.....	667	35.6	.....	.....	8	0.4	11	0.6	23	1.2	40	2.1	4	0.2	100	5.3	153	8.2	266	14.2	342	18.2	179	9.5	55	2.9	.....	.....	23	1.5
Benzol	1,873	.....	.....	214	11.4	.....	.....	11	0.6	.....	.....	.....	.....	62	3.3	17	0.9	64	3.4	5	0.3	285	15.2	7	0.4	392	20.9	773	41.3	4	0.2	39	2.1
Antimony and its compounds.....	1,868	.....	.....	562	30.1	.....	.....	46	2.5	.....	.....	.....	.....	155	8.3	72	3.9	.....	.....	6	0.3	1	0.1	.....	.....	548	29.2	473	25.6	.....	.....	.....	.....
Alcohols, esters and ethers.....	1,795	.....	.....	334	18.6	7	0.4	34	1.9	2	0.1	379	21.1	144	8.0	5	0.3	103	5.7	73	4.1	30	1.7	60	3.3	213	12.1	310	17.3	1	0.1	95	5.3
Chromium and its compounds.....	1,735	.....	.....	743	43.1	.....	.....	119	6.9	.....	.....	.....	.....	175	10.1	401	23.1	.....	.....	32	1.8	24	1.4	13	0.7	2	0.1	221	12.7	.....	.....	.....	.....
Coal tar products.....	1,652	.....	.....	606	36.7	.....	.....	120	7.3	1	0.1	.....	.....	332	20.1	4	0.2	.....	.....	7	0.4	21	1.3	1	0.1	19	1.2	532	32.2	.....	.....	9	0.5
Halogenated hydrocarbons.....	1,110	.....	.....	106	9.6	.....	.....	23	2.1	11	1.0	.....	.....	63	6.1	24	2.2	4	0.4	2	0.2	195	17.6	16	1.4	270	25.1	327	29.5	6	0.5	32	7.4
Infections	1,104	.....	.....	12	1.5	.....	.....	6	0.8	.....	.....	669	60.6	.....	.....	.....	.....	180	16.3	.....	.....	.....	.....	126	11.4	.....	.....	.....	.....	.....	.....	.....	.....
Accelerators	1,101	.....	.....	509	69.2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1,091	99.1	3	0.3	.....	.....	.....	.....
Organic acids	1,083	.....	.....	96	8.6	.....	.....	.....	.....	.....	.....	65	6.0	.....	.....	85	3.2	129	11.9	6	0.6	49	4.5	129									

TABLE 12 — PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS (FOR ALL INDUSTRIES SURVEYED)

PERCENT OF EXPOSED WORKERS HAVING SPECIFIED CONTROL										
Number of Exposures										
	Positive Ventilation	Negative Ventilation	Local Exhaust	Enclosure	Wet Method	Gas Mask	Respirator	Pressure Helmet	Protective Clothing	Other
Other metals	3.5	10.2	18.7	2.0	5.9	.....	2.1	0.3	13.1	0.1
Carbon monoxide	14.5	13.6	25.8	2.5	.....	0.1	.....	0.1	0.0	0.0
Silicate gases	45.748	12.1	11.5	1.5	13.4	.....	1.7	0.5	0.0	0.0
Other gases	43.382	16.0	17.0	5.1	.....	0.4	.....	0.1	.....	0.0
Petroleum products	37.885	0.0	1.3	0.9	.....	.....	0.0	.....	6.3	0.2
Silica dust	31.093	16.1	8.6	1.9	12.8	.....	2.6	0.7	0.1	0.0
Organic dusts	25.701	2.6	21.4	1.3	.....	0.0	1.1	0.0	0.3	0.0
Non-silicicous dusts	19.124	7.3	24.2	0.9	10.0	.....	3.6	0.0	0.0	.....
Temperature change	15.686	.....	.....	.....	.....	.....	.....	.....	.....	.....
Coal dust (bituminous)	14.470	45.0	1.7	0.3	0.4	0.3	0.7	.....	9.3	0.2
Lead and its compounds	12.865	3.4	18.3	1.3	3.0	.....	4.5	0.2	0.6	0.0
Alkaline compounds	10.189	0.4	12.9	1.1	0.9	.....	2.0	.....	11.3	0.1
Organic solvents	10.086	3.0	16.8	4.0	.....	1.0	.....	.....	3.9	0.1
Dermatitis producers	8.837	.....	.....	0.1	.....	.....	.....	.....	6.0	.....
Core gases	8.381	1.3	8.3	1.2	.....	.....	.....	.....	.....	.....
Oils, fats and waxes	6.878	7.4	3.0	3.4	3.4	.....	.....	.....	4.5	0.7
Mineral acids	5.803	2.4	26.5	9.8	.....	0.4	.....	.....	28.1	0.8
Paints and enamels	5.286	4.1	21.9	0.7	.....	.....	11.0	3.2	9.8	0.3
Lacquers and varnishes	4.583	2.6	31.4	1.1	.....	.....	12.4	1.7	9.3	0.1
Inks	4.064	.....	.....	0.3	.....	.....	.....	.....	1.7	0.0
Salts	4.036	.....	6.5	13.9	4.2	0.1	1.3	.....	6.8	0.0
Other chemicals	2.929	3.2	23.6	5.6	0.0	0.7	2.6	0.0	7.7	.....
Sulfur	2.131	1.3	30.9	5.8	5.8	.....	1.6	.....	2.2	6.1
Dyes	1.876	0.4	13.5	4.6	3.8	.....	3.8	.....	20.7	.....
Benzol	1.873	48.9	57.3	10.0	14.2	2.6	.....	.....	1.2	.....
Antimony and its compounds	1.908	16.1	59.6	44.6	3.9	.....	3.3	6.7	14.3	.....
Alcohols, esters and ethers	1.795	0.3	15.0	13.3	3.5	.....	.....	.....	1.6	.....
Chromium and its compounds	1.735	2.5	40.0	35.0	6.2	.....	2.9	.....	19.5	1.0
Coal tar products	1.652	.....	16.1	19.4	16.5	0.7	0.4	.....	6.3	.....
Halogenated hydrocarbons	1.110	11.6	42.4	20.3	.....	0.8	.....	.....	19.7	0.3
Infections	1.104	.....	.....	0.2	.....	.....	.....	.....	3.1	.....
Accelerators	1.101	3.4	61.7	2.8	.....	.....	1.8	.....	3.8	.....
Organic acids	1.083	19.9	12.6	5.3	.....	.....	2.3	.....	7.1	.....
Manganese and its compounds	979	1.4	12.1	4.4	5.7	.....	2.8	.....	2.3	.....
Fluorides	883	.....	31.5	3.2	15.7	.....	5.8	.....	7.1	.....
Cyanides	782	7.7	33.8	46.0	4.0	.....	0.3	.....	26.6	1.9
Phosphorous and compounds	736	.....	44.3	0.1	7.3	.....	.....	.....	0.1	.....
Asbestos dusts	585	8.9	10.4	1.0	1.4	.....	0.7	.....	.....	.....
Cadmium and its compounds	471	.....	31.2	46.7	0.6	.....	1.1	.....	22.7	.....
Sulfur dioxide	416	1.4	2.9	27.2	.....	.....	.....	.....	.....	.....
Medicinals	325	.....	7.7	0.6	.....	.....	4.9	.....	8.9	.....
Coal dust (anthracite)	251	.....	.....	9.7	.....	.....	.....	.....	.....	.....
Aldehydes	216	.....	23.6	29.6	.....	.....	.....	.....	6.0	.....
Mercury and its compounds	141	.....	19.9	13.5	.....	.....	.....	.....	.....	.....
Arsenic and its compounds	130	.....	15.4	12.3	.....	9.2	20.8	.....	6.9	.....
Hydrogen sulfide	128	32.0	64.8	44.5	.....	.....	.....	.....	.....	.....
Aniline and its compounds	63	.....	.....	.....	.....	.....	.....	.....	.....	.....
Selenium and its compounds	49	.....	.....	.....	.....	.....	38.8	.....	.....	.....
Amines	20	.....	60.0	60.0	.....	.....	.....	.....	.....	.....

which the process is controlled through openings that admit tools or hands of the operators into the cabinet. The objective is to protect the operators and other workers in the environment against the hazards of the process.

- E. Wet Methods: Refers to the use of water or other liquids as in rock drilling or hydraulic knock-outs, for the purpose of allaying dusts, created in certain processes. If a wet process has been substituted for a dry process, note this fact.
- F. Personal Respiratory Protection: Record whether gas masks, respirators, or pressure helmets are used. In the case gas masks and respirators are in use, note whether they are types approved by the United States Bureau of Mines. If approved, the official government seal and name of the Bureau will be stamped on the equipment. Note type of personal respiratory protection in all cases.
- G. Protective Clothings: Note use of goggles, aprons, gloves, rubber boots, etc."

Table 12 summarizes the control facilities for all industries, listed according to material exposures. For example, it is noted in this table, that of 31,093 workers exposed to silica, 16.1% of these are benefited by positive general ventilation, 7.0% by negative general ventilation, and 8.6% by local exhaust, etc. Surveyors were instructed to indicate the use of approved control devices, but no differentiation is made in the following tables. It is not assumed that the existing of a control measure necessarily eliminates the hazardous condition since the determination of the effectiveness of such measures requires the application of precise chemical and engineering determinations and is also outside the scope of the survey. Such determinations would show that many uncontrolled potential exposures are not of a sufficient degree to constitute actual hazards. The institution of control measures under such conditions would be an unnecessary procedure. It is therefore not presumed that the number of control measures should ever equal the number of exposures.

COMBINATION OF OCCUPATIONS

The "exposure by occupation" tables for each of the 93 industrial groups present the number of workers engaged in a particular occupation who are exposed to certain specified materials. Since the total number of occupations listed by the surveyors exceeds 200 in certain industrial subdivisions, it was deemed impractical to list each occupation separately. Therefore, in many cases two or more occupations were combined under one name.

A standard procedure was adopted for this purpose which is outlined as follows:

1. All material exposures were listed in the numerical order of their incidence in each individual table.
2. All occupations except "maintenance" and "other" were listed in alphabetical order.
3. An arbitrary occupation "maintenance" was created to include workers engaged primarily in maintaining plant equipment and generating heat and power. It can be seen that the duties of the workers of this group are not peculiar to the specific industry in which they are employed and can, therefore, be logically grouped together. Examples of occupations in this group are firemen, mechanics, millwrights, oilers, engineers, janitors, etc.
4. Occupations in which the essential duties and materials exposures are identical or similar were combined and listed under the most prevalent and descriptive name for that group of occupations. For example, in the brick and tile industry, hackers, break-off-men, cut-off-men, off bearers, and pick-off-men, were combined under the name "hackers". These combinations of occupations for each industrial subdivision are indicated in the appendix.
5. All individuals engaged in a supervisory capacity such as foremen, superintendents, managers, etc., were listed under supervisors.
6. Atypical occupations and others which had only a small number of exposures were combined under "other". For example, a plant in the pottery group was engaged primarily in the manufacture of clay products but also maintained a small foundry to make plumbing fixtures where occupations such as core makers, platers, etc., were indicated. These were placed in the "other" occupation in the pottery group.

EDITORIAL PROCEDURES

Although the types of plants which make up each individual industrial subdivision are for the most part similar, there will also be found certain examples where this is not the case. In the glass industry group are found plate glass, safety glass, bottles, cut glass, glass wool, and spun glass. While certain fundamental operations in all of these are similar there are many occupations which are not common to all. Dissimilarities exist even among the different members of minor industrial subdivisions. Any attempt to further combine these into major industrial groups for the purpose of occupational exposure relationship would render such tables valueless. They would be composed of congruous elements. To assist in an interpretation of these tables, the reader is referred to Table I, appendix, which lists the types of industry included under each industrial subdivision. Discussion of the exposure by occupation tables will be limited generally to points of interpretation and editorial procedure in which certain explanations will clarify apparently unrelated tabulations.

A table which indicates the control measures according to material exposure in terms of percentage of controlled exposures accompanies each occupational table. These tables will be discussed in connection with the occupational exposure tables. In the interpretation of these tables it should be noted that the totals of the percentage under control is not necessarily equivalent to the percentage of total exposure under control. For example, let us assume that 99 workers were exposed to chromium, of which 33.3% are protected by local exhaust, 33.3% by negative ventilation and 33.3% by protective clothing. This might indicate that 33 workers were provided with all these types of controls, or that 33 workers were protected with positive ventilation, and an additional 33 with local exhaust and protective clothing; or that each type control measure applies to a different group of workers.

Examples of materials included under each major classification are found in Table III of the appendix. This list, although not complete, includes all the important types of substances encountered in this survey. To interpret correctly the various material exposure and control tables, it is necessary not only to identify the substances but also to know in what situation the workman was charged with certain specified exposures. The latter very often becomes a matter of editorial judgment. Certain arbitrary procedures were adopted which were closely adhered to for all surveys edited. Certain editorial procedures pertain only to a particular type of industry and are, therefore, considered in their proper place. Some of the most important procedures pertaining to both material exposures

and their controls which are related to a large portion of the entire survey are listed as follows:

1. In certain cases control measures were credited to a material exposure in which there may have been no intention of alleviating an industrial hazard. For example, local exhaust was credited to exhaust operations where the primary purpose was the efficient disposal of the saw dust. Wet method was credited to the control of silica dust in certain pottery operations where the wetting of the material was an integral part of the operation. Enclosure was credited to distillation processes in which enclosure was indispensable to the process itself. The fact that these measures were not designed to alleviate industrial hazards does not render them any the less effective, or is the possibility of actual hazard eliminated when such processes are carried out ineffectively.
2. Protective devices for some specific hazard may in certain cases be properly credited to other exposures for which they were not specifically intended. For example, a local exhaust primarily intended to remove silica dust from a sandstone grinding wheel was also credited with the removal of metal dust. A respirator intended to protect the worker against lead dust was also presumed to remove organic dusts which might be encountered in the process.
3. Dermatitis producers include only such materials not specified in some other classification when these substances were known to cause skin affections. Materials such as chromates and alkalis may cause dermatitis. They are, however, listed under "chromium and its compounds" and "alkaline compounds" and not under "dermatitis producers".
4. "Temperature change", in general, was recorded in situations where the materials, particularly metals, were heated to a point of visible radiation. Ordinary ventilation facilities were not presumed as effective control measures for such exposures.
5. "Carbon monoxide" was charged to any occupation where the possibility of incomplete combustion of carbonaceous substances prevailed. Local exhaust was credited to carbon monoxide exposures where such combustion was properly vented regardless of whether the exhaust was natural or mechanical in origin.
6. Acetylene welders were charged with "other metals", "other gases", and "carbon monoxide" exposures. Electric welders

were charged with "other gases" and "other metals". A protective measure such as goggles, or welder's helmet was credited to the exposure of "other metals" only. The manner of handling this control measure may appear illogical, but no other solution was found practical.

7. "Sulfur dioxide" exposure was confined to conditions of burning sulfur and handling liquid sulfur dioxide and not to the combustion of coal and its products. Although it is realized that quantities of sulfur dioxide may be formed in the combustion of coal, these exposures are not ordinarily regarded as industrial health hazards.
8. Refrigerant gases were listed as material exposures where workmen were engaged in the vicinity of refrigerator systems. An enclosed process here indicates that the gas may only become a hazard in the event of equipment breakdown. The same applies for enclosed distillation processes.
9. The term "petroleum products" includes all non-volatile petroleum products. "Oils, fats, and waxes" do not include petroleum products, but only vegetable and animal oils. Volatile petroleum products such as gasoline, naphtha, etc., were classified under "other solvents".
10. Exposures which may appear unrelated to the occupation under which they are listed frequently occur. These exposures may be due to materials used in nearby work processes. They may also be attributable to the common practice in small plants of assigning a workman to a number of unrelated tasks. For example, a foundry molder might be engaged part time in the plating department which would give him atypical exposures to cyanide, chromium, and mineral acids.

EXTRACTION OF MINERALS

Table 13 indicates the number and percentage of total exposures to specified materials in each subdivision of this group.

TABLE 13—EXTRACTION OF MINERALS—EXPOSURE TO SPECIFIED MATERIALS

Materials	Number of workers exposed to specified materials	Number and Percentages of Total Exposures to the Specified Materials in Each Industrial Subdivision			
		Coal mines		Other mines	
		No.	%	No.	%
Coal dust (bituminous).....	7,305	7,293	99.8	12	0.2
Silicate dusts.....	6,782	6,685	99.3	47	0.7
Other gases	4,645	4,590	98.8	55	1.2
Silica dusts	4,510	4,476	99.2	34	.03
Carbon monoxide	4,467	4,411	98.7	56	1.3
Non-silicious	1,179	1,067	90.5	112	9.5
Petroleum products	650	629	96.8	21	3.2
Sulfur	121	121	100	...	...
Oils, fats and waxes.....	76	75	98.7	1	1.3
Lead and its compounds.....	31	31	100	...	...
Organic dusts	26	22	84.6	4	15.4
Other metals	18	18	72.2	5	27.8
Asbestos dusts	10	...	...	10	100
Paints and enamels.....	8	8	100	...	...
Mineral acids	7	7	100	...	...
Dermatitis producers	7	7	100	...	...
Other chemicals	2	2	100	...	...
Alkaline compounds	1	1	100	...	...
Organic solvents.....	1	1	100	...	...

Coal Mines (Tables 14 and 14a)

There were 7,542 workers surveyed in the coal mining industry. The principal exposures were coal dust, silicate dusts, other gases, silica dust, and carbon monoxide. Loaders, laborers, operators, and motor men comprised the principal occupations exposed to these materials. General positive ventilation was the chief control. Of the 4,476 workers exposed to silica dust, 99.2% were provided with general positive ventilation. Wet methods were credited to operations where the mine was usually wet.

Other Mines (Tables 15 and 15a)

The principal exposures in this group were non-silicious dusts, carbon monoxide, other gases, and silicate dusts. About three-fourths of the workers in this subdivision were engaged in mining gypsum and fabricating gypsum products. The principal occupations were loaders, operators, and mixers. General positive ventilation, local exhaust, and wet methods were the only controls listed.

TABLE 14 — COAL MINES — EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																	
	Coal dust (bituminous)	Silicate dusts	Other gases	Silica dust	Carbon monoxide	Non-silicious dusts	Petroleum products	Sulfur	Oils, fats, and waxes	Lead and its com- pounds	Organic dusts	Other metals	Paints and enamels	Mineral acids	Dermatitis producers	Other chemicals	Alkaline compounds	Organic solvents
Total number of workers in plants surveyed, 7,543	7,293	6,685	4,590	4,476	4,411	1,067	629	121	75	31	22	13	8	7	7	2	1	1
Number of workers exposed.....	96.7	88.6	60.9	59.3	58.5	14.1	8.3	1.6	1.0	0.4	0.3	0.1	0.1	0.1	0.1	0.0	0.0	0.0
Percent of workers exposed.....																		
Brakemen	86	40	30	78	...	14	...	...	...	...	...	...	...	...	...	...	...	...
Car droppers	21	17	3	4	...	9	...	...	...	...	...	...	...	...	...	...	...	...
Clean up men	86	86	...	84	...	86	...	...	...	...	...	...	...	...	...	...	...	...
Clerks	97	6	...	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Drillers	72	72	39	24	...	55	4	...	...	...	...	...	...	...	...	...	...	...
Dumppers	21	9	4	4	...	9	...	...	...	...	...	...	...	...	...	...	...	...
Labors	405	303	50	180	126	64	70	...	15	...	1	...	7	...	...	...	...	...
Loaders	4,208	4,198	3,850	2,626	3,890	306	...	115	...	...	...	...	...	...	...	...	...	...
Motor men	398	322	100	349	49	75	136	...	...	...	...	...	...	...	...	...	...	...
Mule drivers	106	108	62	87	36	25	...	...	...	...	...	...	...	...	...	...	...	...
Operators	670	620	94	374	20	184	263	...	3	...	...	...	...	...	...	...	...	...
Pickers	147	74	7	6	...	45	29	6	...	...	...	...	...	...	...	...	...	...
Pick miners	19	...	9	13	9	...	...	...	...	...	...	...	...	...	...	...	...	...
Pumpers	54	45	14	33	...	...	7	...	...	...	...	...	...	...	...	...	...	...
Recovery men	21	21	...	...	...	21	...	...	...	...	...	...	...	...	...	...	...	...
Shooters	47	20	44	10	50	...	5	...	...	...	...	...	...	...	...	...	...	...
Supply men .....	...	...	48	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Supervisors	91	89	29	91	19	14	8	...	1	...	...	...	...	...	7	...	...	...
Timber men	192	188	58	111	24	63	...	...	...	...	...	...	...	...	...	...	...	...
Tipple men	36	24	...	34	...	...	4	...	...	...	...	...	...	...	...	...	...	...
Trackmen	245	250	91	251	44	66	...	...	...	...	...	...	...	...	...	...	...	...
Truck drivers	49	40	...	...	35	...	34	...	8	...	...	...	...	...	...	...	...	...
Other	222	154	58	96	108	11	7	...	6	...	...	...	...	...	...	...	...	...
Maintenance	222	154	58	96	108	11	7	...	42	31	21	13	1	...	...	2	1	1

TABLE 14a—COAL MINES—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Coal dust (bituminous)	Silicate dusts	Other gases	Silica dust	Carbon monoxide	Non-silicious dusts	Sulfur	Lead and its com- pounds	Faints and enamels	Mineral acids	Other chemicals
Number of workers exposed....	7,293	6,685	4,590	4,476	4,411	1,067	121	31	8	7	2
General positive ventilation....	88.0	94.4	99.3	99.2	95.3	92.1	...	90.3	12.5	...	...
Local exhaust .....	...	...	0.2	...	0.7	...	...	6.4	...	...	...
Enclosure .....	...	...	...	...	0.2	...	...	3.2	...	...	...
Wet method	11.5	13.6	1.0	20.6	...	...	95.0	...	...	...	...
Respirator	0.6	0.6	...	0.9	...	...	...	...	...	...	...
Pressure helmet .....	...	...	...	...	0.3	...	...	...	...	...	60.0
Protective clothing .....	...	...	...	...	...	...	...	...	...	42.8	60.0

Materials for which no control measures were indicated are as follows: Petroleum products (629); Oils, fats and waxes (75); Organic dusts (22); Other metals (13); Dermatitis producers (7); Alkaline compounds (1); Organic solvents (1).

TABLE 15—OTHER MINES—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation									
	Non-silicious dusts	Carbon monoxide	Other gases	Silicate dusts	Silica dust	Petroleum products	Coal dust (bituminous)	Asbestos dusts	Other metals	Organic dusts
Total number of workers in plants surveyed, 188										
Number of workers exposed....	112	56	55	47	34	21	12	10	5	4
Percent of workers exposed....	59.6	29.8	29.3	25.0	18.1	11.2	6.4	5.3	2.7	2.1
Chargers	2	...	...	2	...	...	...	2	...	...
Crushers	2	2	2	...	...	...	...	...	...	...
Drill men	6	6	6	...	...	...	...	...	...	...
Hoist men	2	2	2	...	...	...	...	...	...	...
Kettle men	4	4	...	...	...	...	4	...	...	...
Laborers	1	...	...	21	20	13	...	1	...	...
Loaders	20	16	16	...	...	...	...	...	...	4
Operators	11	...	...	5	3	...	...	4	...	...
Puddlers	6	...	...	...	...	...	...	...	...	...
Roofmen	3	3	3	...	...	...	...	...	...	...
Shooters	2	2	2	...	...	...	...	...	...	...
Stone pickers	3	3	3	...	...	...	...	...	...	...
Supervisors	3	1	1	4	2	...	...	2	...	...
Take off men	9	...	...	...	...	...	...	...	...	...
Track men	4	3	3	...	...	...	...	...	...	...
Truck drivers	4	4	4	5	3	...	...	...	...	...
Other	20	...	...	4	3	...	...	...	...	1
Maintenance	6	10	13	6	3	8	8	1	5	...

TABLE 15a—OTHER MINES—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Non-silicious dusts	Carbon monoxide	Other gases	Other metals
Number of workers exposed.....	112	56	58	5
General positive ventilation.....	89.3	78.3	80.0	60.0
Local exhaust .....	.....	16.1	.....	.....
Wet method	25.9	.....	.....	.....

Materials for which no control measures were indicated are as follows: Silicate dusts (47); Silica dust (34); Petroleum products (21); Coal dust (bituminous) (12); Asbestos dusts (10); Organic dusts (4); Oils, fats, and waxes (1).

CHEMICAL AND ALLIED INDUSTRIES

Table 16 indicates the percentage of the total exposures in the chemical and allied industries for each minor group in this classification. It is evident that the industries in this major group are so diversified in character that an individual discussion of each is necessary.

Charcoal and Coke (Tables 17 and 17a)

The principal exposures in this group are bituminous coal dust, other gases, and carbon monoxide. Benzol and coal tar products, also important exposures, are extensively controlled by enclosures. These enclosures are actually an integral part of the coal tar recovery process. It is recognized, however, that faulty maintenance of the distillation equipment might result in a serious hazard from coal tar by-products, and they are therefore indicated as potential hazards.

TABLE 16. CHEMICAL AND ALLIED-EXPOSURES TO SPECIFIED MATERIALS

[illegible]

TABLE 16. CHEMICAL AND ALLIED—EXPOSURE TO SPECIFIED MATERIALS—Concluded

Materials	Number and Percentage of Total Exposures to the Specified Materials in Each Industrial Subdivision									
	Soap factories	Blackings, cleaners, etc.	Chemicals (as such)	Dye-stuffs, inks	Patent medicines, drugs	Other chemicals	Matches			
	No.	%	No.	%	No.	%	No.	%	No.	%
Alkaline compounds.....	956	41.0	63	2.7	697	29.9	49	2.1	40	1.7
Salts.....	51	2.2	73	3.2	983	42.6	215	9.3	31	1.3
Organic dusts.....	74	3.4	55	2.5	181	6.0	102	4.7	130	5.9
Other gases.....	153	7.7	16	0.4	813	40.9	53	2.7	4	0.2
Petroleum products.....	225	13.2	7	0.3	373	21.9	26	1.5	37	2.2
Other metals.....	46	3.0	.....	.....	227	14.7	64	4.1	35	2.3
Carbon monoxide.....	142	9.5	4	0.3	623	41.9	22	1.5	13	0.9
Non-silicious dusts.....	4	0.3	1	0.1	361	24.5	4	0.3	18	1.2
Oils, fats and waxes.....	446	34.7	4	0.3	15	1.2	37	2.9	55	4.3
Silicate dusts.....	111	9.5	36	3.0	224	18.5	16	1.3	22	1.8
Organic solvents.....	110	9.5	11	0.9	29	2.5	103	8.9	46	4.0
Dermatitis products.....	382	34.5	27	2.4	1	0.1	214	19.3	141	12.7
Coal dust (bituminous).....	57	5.7	2	0.2	424	42.5	57	5.7	9	0.9
Other chemicals.....	177	18.9	1	0.1	102	11.7	175	18.7	265	28.3
Lead and its compounds.....	50	6.2	.....	.....	95	10.9	100	12.4	32	4.0
Mineral acids.....	75	9.5	.....	.....	122	15.5	227	28.8	9	1.1
Chromium and its compounds.....	3	0.4	.....	.....	43	5.7	55	7.4	2	0.3
Sulfur.....	61	9.1	.....	.....	38	5.5	51	7.4	.....	.....
Dyes.....	61	9.1	4	0.6	.....	.....	319	47.8	6	0.9
Coal tar products.....	51	8.4	.....	.....	44	7.3	100	16.5	39	6.4
Paints and enamels.....	33	5.7	.....	.....	16	2.8	.....	.....	16	2.8
Antimony and its compounds.....	.....	.....	.....	.....	17	3.0	.....	.....	.....	.....
Phosphorus and its compounds.....	7	1.4	.....	.....	.....	.....	.....	.....	.....	.....
Lacquers and varnishes.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Silica dust.....	66	14.4	10	2.2	17	3.5	14	2.9	1	0.2
Organic acids.....	173	45.2	.....	.....	50	10.9	39	8.5	1	0.2
Inks.....	87	25.6	3	0.9	57	14.9	35	9.1	42	11.0
Alcohols, esters and ethers.....	9	2.7	11	8.3	14	4.1	28	8.2	55	16.2
Medicinals.....	.....	.....	.....	.....	27	8.1	33	11.4	39	11.7
Benzol.....	30	14.0	.....	.....	.....	.....	1	0.3	313	99.7
Fluorides.....	1	0.5	.....	.....	40	18.7	.....	.....	3	1.4
Manganese and its compounds.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Infections.....	9	8.5	.....	.....	.....	.....	5	4.1	3	2.5
Aldehydes.....	17	16.5	.....	.....	13	17.5	47	45.6	2	1.9
Sulfur dioxide.....	.....	.....	.....	.....	39	39.4	.....	.....	13	17.5
Halogenated hydrocarbons.....	.....	.....	.....	.....	26	27.1	35	36.5	5	5.2
Asbestos dusts.....	2	3.0	.....	.....	.....	.....	.....	.....	.....	.....
Aniline and its compounds.....	.....	.....	.....	.....	7	11.3	47	75.8	5	5.2
Cadmium and its compounds.....	.....	.....	.....	.....	55	100.0	.....	.....	13	17.5
Arsenic and its compounds.....	.....	.....	.....	.....	12	24.0	.....	.....	1	1.0
Hydrogen sulfide.....	.....	.....	.....	.....	.....	.....	.....	.....	5	5.2
Mercury and its compounds.....	.....	.....	.....	.....	.....	.....	.....	.....	3	4.5
Amines.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Hydrogen sulfide.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mercury.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cyanides.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Accelerators.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Temperature change.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

TABLE 17—CHARCOAL AND COKE—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation											
	Coal dust (bituminous)	Other gases	Carbon monoxide	Coal tar products	Benzol	Petroleum products	Silicate dusts	Alkaline compounds	Mineral acids	Sulfur dioxide	Other metals	Other chemical
Total number of workers in plants surveyed, 879												
Number of workers exposed....	267	180	178	150	66	66	28	25	25	15	12	5
Percent of workers exposed....	70.4	47.5	47.0	39.6	17.4	17.4	7.9	6.6	6.6	4.0	3.2	1.3
Chemists .....	...	...	...	5	8	...	...	...	...	...	...	5
Coke handlers	19	...	11	...	...	...	...	...	...	...	...	...
Dipper	2	...	...	...	...	2	...	...	...	...	...	...
Engineers	3	5	5	...	...	13	...	...	...	...	...	...
Finishers	10	...	...	...	...	...	10	...	...	...	...	...
Inspectors	12	...	...	...	...	12	...	...	...	...	...	...
Laborers	8	6	6	6	...	...	...	...	...	...	...	...
Mechanics	50	29	29	29	...	29	...	...	...	...	...	...
Operators	58	60	22	32	11	10	12	25	25	...	12	...
Oven men	52	52	52	52	52	...	...	...	...	...	...	...
Packers	12	12	12	...	...	...	...	...	...	...	...	...
Sealers .....	...	...	...	...	...	...	6	...	...	...	...	...
Supervisors	26	26	26	26	...	...	...	...	...	...	...	...
Train crew	15	...	15	...	...	...	...	...	...	15	...	...

TABLE 17a—CHARCOAL AND COKE—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Coal dust (bituminous)	Other gases	Carbon monoxide	Coal tar products	Benzol	Petroleum products	Silicate dusts	Mineral acids	Alkaline compounds	Sulfur dioxide	Other metals
Number of workers.....	267	180	178	150	66	66	28	25	25	15	12
Ventilation	5.2	...	...	...	...	...	...	...	...	...	...
Local exhaust	2.2	2.8	11.2	...	...	...	21.4	...	...	100.0	...
Enclosure	23.2	78.8	65.2	96.7	95.5	3.0	...	100.0	100.0	...	...
Wet method	5.2	...	...	...	...	...	21.4	...	...	...	...
Protective clothing.....	...	...	...	...	...	3.0	...	...	...	...	100.0
Other .....	...	...	...	...	...	9.1	...	...	...	...	...

Materials for which no control measures were indicated are as follows: Chemicals (5).

Explosives and Ammunition (Tables 18 and 18a)

The principal exposures in this group are organic dusts, other metals, and salts. Other more serious hazards such as arsenic, mercury, antimony, and lead are also present, although to a lesser extent. The only significant control measures are negative ventilation and local exhaust.

TABLE 18.—EXPLOSIVES AND AMMUNITION—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																									
	Organic dusts	Other metals	Salts	Petroleum products	Sulfur	Inks	Arsenic and its compounds	Carbon monoxide	Other chemicals	Alcohols, esters and ethers	Dermatitis producers	Non-silicious dusts	Silicate dusts	Lead and its compounds	Other gases	Mercury and its compounds	Coal dust (bituminous)	Antimony and its compounds	Alkaline compounds	Lacquers and varnishes	Mineral acids	Organic solvents	Coal tar products	Organic acids	Cyanides	
Total number of workers in plants surveyed, 423	88	85	78	64	49	42	38	32	30	28	28	24	22	22	22	21	17	17	12	12	9	4	2	2	1	
Number of workers exposed.....	20.8	20.1	18.4	15.1	11.6	9.9	9.0	7.6	7.1	6.6	6.6	5.7	5.2	5.2	5.2	5.0	4.0	4.0	2.8	2.8	2.1	0.9	0.5	0.5	0.2	
Percent of workers exposed.....																										
Coaters .....	...	...	...	8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Explosive makers	1	3	2	...	...	...	...	...	...	...	8	...	...	3	...	2	...	3	...	...	...	...	3	2	...
Fillers	24	24	28	...	28	...	24	...	...	24	...	24	...	...	...	...	...	...	...	...	...	...	...	...	...
Finishers	3	...	...	...	...	...	3	...	...	...	7	...	...	...	...	...	...	8	...	...	...	...	...	...	...
Laborers .....	...	...	16	...	...	4	5	2	...	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...	...
Mixers	7	...	8	...	3	...	2	...	5	2	...	...	...	...	...	...	5	...	...	...	...	...	...	...	...
Operators	21	12	4	21	...	...	2	...	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Packers	18	...	24	2	12	87	...	6	18	...	12	...	...	18	4	10	...	10	...	6	...	...	...	...	...
Platers	1	1	...	...	...	...	2	...	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pressman	1	2	2	...	2	...	2	...	...	2	...	...	...	...	...	...	...	...	...	6	...	...	...	...	...
Supervisors	4	4	4	...	...	...	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Technical men	1	...	...	...	...	...	1	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Maintenance men	6	37	...	38	...	...	...	18	2	...	...	28	...	2	3	...	15	...	1	1	1	...	...	...	...

TABLE 18a—EXPLOSIVES AND AMMUNITION—PERCENTAGE OF
EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES
FOR SPECIFIED MATERIALS

Control Measures	Organic dusts	Other metals	Salts	Petroleum products	Sulfur	Arsenic and its compounds	Carbon monoxide	Other chemicals	Alcohols, esters and ethers	Lead and its compounds	Other gases	Alkaline compounds	Lacquers and varnishes	Mineral acids	Cyanides
Number of workers exposed	88	85	78	64	49	38	82	80	28	22	22	12	12	9	1
General negative ventilation	5.7	2.4	...	1.6	4.1	5.8	12.5	...	7.1	13.6	13.6	...	16.7	11.1	...
Local exhaust.....	14.8	11.8	3.8	...	...	...	62.5	10.0	...	45.5	...	...	8.3	...	...
Enclosure .....	...	...	...	...	...	...	...	...	...	...	4.6	...	...	...	...
Protective clothing.....	...	2.4	...	...	...	...	...	...	...	...	...	25.0	...	11.1	100.0

Materials for which no control measures were indicated are as follows: Inks (42), Dermatitis producers (28), Non-silicious dusts (28), Silicate dusts (24) Mercury and its compounds (21), Coal dust (bituminous) (17), Antimony and its compounds 17), Organic solvents (4), Coal tar products (2), and Organic acids (2).

Fertilizer Factories (Tables 19 and 19a)

Fertilizer mixing and acidulating plants, and tankage plants, two widely separated types of industry, are included in this group. In the first type the principal exposures are the various dusts arising from fertilizer mixing operations; acids; and fluorides, a by-product of acidulation. Dermatitis producers and infection hazards are important exposures in the tankage plants. The prevalence of enclosures is indicative of enclosed grinding and acidulating operations.

TABLE 19 — FERTILIZER FACTORIES — EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																							
	Salts	Organic dusts	Non-silicious dusts	Alkaline compounds	Mineral acids	Silica dust	Fluorides	Other gases	Dermatitis producers	Infections	Carbon monoxide	Silicate dusts	Petroleum products	Sulfur dioxide	Sulfur	Oils, fats, and waxes	Lead and its compounds	Organic solvents	Other metals	Coal dust (bituminous)	Inks	Other chemicals	Lacquers and varnishes	Paints and enamels
Total number of workers in plants surveyed, 953	541	507	479	263	224	191	181	170	135	95	59	35	33	32	32	28	27	24	19	19	7	3	1	1
Number of workers exposed..	541	507	479	263	224	191	181	170	135	95	59	35	33	32	32	28	27	24	19	19	7	3	1	1
Percent of workers exposed..	56.8	53.2	50.3	27.6	23.5	20.0	19.0	17.8	14.2	10.0	6.2	3.7	3.5	3.4	3.4	2.9	2.8	2.5	2.0	2.0	0.7	0.3	0.1	0.1
Acidmakers	5	..	..	..	9	..	..	9	..	..	..	..	..	5	8	..	5	..	..	..	..	..	..	..
Acidulators	1	1	..	..	7	..	5	2	6	6	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Baggers	12	17	8	..	..	11	..	6	6	6	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Burners	..	..	..	..	8	..	..	..	..	..	11	..	..	13	14	..	..	..	..	..	..	..	..	..
Carmen	10	10	15	2	7	..	6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Cookers	..	..	..	..	..	..	..	3	8	2	..	..	..	..	..	3	..	3	..	..	..	..	..	..
Extractors	..	..	..	..	3	..	..	..	3	2	..	..	..	..	..	2	..	3	..	..	..	..	..	..
Fertilizer men	..	4	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Grinders	..	6	8	..	..	..	5	6	8	8	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Laborers	169	175	181	118	15	50	..	72	86	25	7	..	..	1	..	15	1	13	..	3	..	..	..	..
Lead burners	7	..	..	..	..	..	..	9	..	..	1	..	..	..	..	..	10	..	..	..	..	..	..	..
Loaders	61	14	69	5	..	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Mill men	152	162	81	127	127	25	127	..	..	..	..	24	..	..	..	..	..	..	..	..	..	..	..	..
Mixers	21	6	24	16	6	12	6	12	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Operators	3	5	7	2	2	3	2	9	8	6	..	..	1	..	..	4	..	..	..	..	..	..	..	..
Packers	..	50	..	50	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Pitmen	4	1	9	..	8	4	9	1	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
Receivers	4	1	10	4	6	4	5	4	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Shippers	42	..	1	46	42	4	42	4	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Skippers	3	12	..	3	..	..	..	..	..	..	..	..	..	..	..	3	..	..	..	..	..	..	..	..
Supervisors	17	18	6	12	9	9	1	7	3	8	3	3	3	10	8	1	9	..	..	..	..	..	..	..
Truckers	14	22	29	8	1	13	7	1	38	22	..	..	..	1	1	..	..	..	..	..	..	..	..	..
Weighters	3	8	7	..	..	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Other	1	5	1	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	7	3	..	..
Maintenance men	12	17	16	7	10	8	4	22	2	..	34	8	32	2	1	..	2	8	19	16	..	..	1	1

TABLE 19a—FERTILIZER FACTORIES—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Salts	Organic dusts	Non-silicious dusts	Alkaline compounds	Mineral acids	Silica dust	Fluorides	Other gases	Dermatitis producers	Infections	Carbon monoxide	Petroleum products	Sulfur dioxide	Oils, fats, and waxes	Organic solvents
Number of workers exposed	540	507	479	263	224	191	181	170	135	95	59	33	32	28	24
Local exhaust.....	1.7	1.9	6.1	1.1	7.1	...	10.5	2.9	...	...	20.3	...	...	...	...
Enclosure	4.4	2.4	8.1	5.7	16.5	6.3	10.5	18.2	4.4	...	8.5	...	65.6	21.4	12.5
Gas mask .....	...	...	...	...	...	...	...	1.2	...	...	...	...	...	...	...
Respirator .....	...	2.6	3.2	2.7	...	...	1.7	...	...	...	...	...	...	...	...
Protective clothing	1.1	1.2	1.8	...	2.2	...	...	...	14.8	21.1	...	3.0	...	...	4.2

Materials for which no control measures were indicated are as follows: Silicate dusts (35), Sulfur (32), Lead and its compounds (27), Other metals (19), Coal dust (bituminous) (19), Inks (7), Other chemicals (3), Lacquers and varnishes (1), and Paints and enamels (1).

Paint and Varnish (Tables 20 and 20a)

The exposures in this group include all materials used in the manufacture of paints, enamels, lacquers, and varnishes. Practically all of the material groups are represented. Occupations concerned with the handling of materials before the paints and varnishes were compounded were noted according to the particular type of material handled. However, workers engaged in handling mixed and compounded products were noted with paint or lacquer exposures only, except in the case of lead products where lead and its compounds were also indicated. Control measures of all types were reported. Enclosures were credited in completely enclosed mixing and milling processes and wet methods in the mixing and compounding of pigments with oils and solvents.

Petroleum Products (Tables 21 and 21a)

The principal exposures in this group are petroleum products, other gases, organic solvents, and carbon monoxide. Volatile petroleum products are classified under organic solvents, and the non-volatile materials are listed under petroleum products. The majority of workers were employed in petroleum refineries, but the majority of plants which are small in size were engaged in the manufacture of grease and lubricating materials. The occupations, boiler makers and pipe fitters, usually combined with the maintenance group, are listed separately here since their work is an important factor in the routine manufacturing process. The principal control measures are local exhaust and enclosure methods.

TABLE 20 — PAINT AND VARNISH — EXPOSURE BY OCCUPATION
TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																
	Oils, fats, and waxes	Paints and enamels	Organic solvents	Lead and its compounds	Lacquers and varnishes	Organic dusts	Other metals	Dyes	Non-silicious dusts	Carbon monoxide	Silicate dusts	Alcohols, esters, and ethers	Organic dusts	Petroleum products	Chromium and its compounds	Manganese and its compounds	Alkaline compounds
Total number of workers in plants surveyed, 2,468	528	488	472	444	426	355	322	247	208	179	163	162	142	126	115	113	111
Number of workers exposed.....	21.4	19.8	19.1	18.0	17.3	14.4	13.0	10.0	8.4	7.3	6.6	6.6	5.8	5.1	4.7	4.6	4.5
Percent of workers exposed.....																	
Cleaners	3	13	18	1	9	...	...	...	2	...	...	8	...	...	...	...	5
Fillers	8	98	...	41	39	5	58	51	52	...	33	46	...	5	28	12	10
Grinders	83	49	77	72	54	84	...	...	...	2	...	...	2	...	...	...	...
Inspectors .....	...	15	...	...	15	...	...	...	...	...	...	...	...	...	...	...	...
Laborers	42	19	22	10	22	42	28	13	9	16	26	12	13	...	...	2	13
Mixers	112	32	109	94	71	62	88	64	70	5	41	31	2	21	35	27	22
Operators	51	10	3	40	4	37	46	84	27	8	23	6	2	14	21	19	21
Painters .....	...	26	1	6	11	3	...	...	...	1	...	...	1	...	...	...	...
Pressmen	14	...	6	1	6	8	...	...	...	14	...	...	14	2	...	6	...
Printers .....	...	...	3	12	...	4	...	...	...	...	...	...	...	2	...	...	...
Pumpers .....	?	...	...	6	4	...	...	2	...	1	...	...	...	...	...	...	...
Receivers	3	...	...	...	...	...	4	...	4	...	...	...	...	...	...	...	...
Shaders	41	56	38	46	31	17	29	23	24	8	22	20	8	5	22	22	19
Shippers	10	32	8	21	14	11	22	9	1	...	...	3	...	11	...	...	...
Supervisors	13	16	12	9	17	13	10	12	3	3	1	2	1	5	2	...	2
Technical men	11	70	18	19	45	...	...	4	2	12	...	3	1	...	1	2	1
Thinners	16	13	17	20	18	5	7	15	5	...	3	...	...	...	...	4	...
Truckers—drivers	4	...	...	...	6	...	3	...	3	...	...	...	...	...	...	...	...
Varnish makers	95	...	84	35	39	80	12	...	...	79	...	16	73	36	1	21	2
Weighters	1	1	1	1	...	5	2	7	...	...	...	2	...	...	...	...	...
Other	13	2	1	1	...	8	...	...	4	3	3	2	3	...	...	...	2
Maintenance	11	36	19	7	21	21	9	1	3	27	7	...	2	22	...	...	14

TABLE 20 — PAINT AND VARNISH — EXPOSURE BY OCCUPATION
TO SPECIFIED MATERIALS — Concluded

Occupations	Number of workers exposed to specified materials by occupation																																	
	Other chemicals			Silica dust		Dermatitis producers		Organic acids		Inks		Benzol		Coal dust (bituminous)		Asbestos dusts		Mineral acids		Coal tar products		Antimony and its compounds		Salts		Sulfur		Aniline and its compounds		Halogenated hydrocarbons		Sulfur dioxide		Aldehydes
Total number of workers in plants surveyed, 2,468	109	82	70	65	57	56	56	45	31	28	19	18	14	8	7	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Number of workers exposed.....	109	82	70	65	57	56	56	45	31	28	19	18	14	8	7	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Percent of workers exposed.....	4.4	3.3	2.8	2.6	2.3	2.3	2.3	1.8	1.3	1.1	0.8	0.7	0.6	0.3	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Cleaners .....	.....	.....	.....	.....	.....	6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Fillers .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Grinders .....	.....	14	.....	9	.....	30	.....	15	.....	7	15	.....	8	.....	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Inspectors .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Laborers	7	10	2	9	.....	.....	14	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mixers	16	19	.....	9	.....	10	4	17	15	9	4	7	6	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Operators	6	11	.....	3	2	.....	6	.....	3	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Painters .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Pressmen .....	.....	.....	.....	.....	14	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Printers .....	.....	.....	.....	.....	20	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Pumpers .....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Receivers .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Shaders .....	.....	3	.....	8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Shippers .....	.....	10	58	1	19	.....	.....	10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Supervisors	2	1	1	.....	2	.....	4	1	.....	1	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Technical men	56	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Thinners	4	.....	.....	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Truckers—drivers .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Varnish makers	14	4	6	18	.....	7	6	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Weighters .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Other .....	.....	3	3	.....	.....	1	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Maintenance	2	2	.....	1	.....	.....	21	.....	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

TABLE 20a — PAINT AND VARNISH — PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Oils, fats, and waxes	Paints and enamels	Organic solvents	Lead and its compounds	Lacquers and varnishes	Organic dusts	Other metals	Dyes	Non-silicious dusts	Carbon monoxide
Number of workers exposed.....	528	488	472	444	426	355	322	247	208	179
General negative ventilation.....	0.4	3.1	4.4	3.6	2.8	3.1	3.4	0.4	1.0	4.5
Local exhaust	2.7	8.8	5.1	5.6	11.3	5.6	1.9	0.4	1.0	72.6
Enclosure	4.4	1.2	7.2	3.6	4.7	4.2	12.1	8.1	1.9	1.7
Wet method .....	....	....	....	4.7	....	5.6	5.6	7.3	8.7	....
Gas mask .....	....	....	0.4	....	....	....	....	....	....	....
Respirator .....	....	....	....	12.2	....	11.3	9.0	6.9	9.1	....
Pressure helmet	0.4	....	....	....	0.5	....	....	....	....	....
Protective clothing.....	5.9	1.2	7.4	4.7	0.9	10.1	9.6	8.1	7.2	....

TABLE 21 — PETROLEUM PRODUCTS — EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Petroleum products	Other gases	Organic solvents	Carbon monoxide	Other metals	Oils, fats, and waxes	Alkaline compounds	Other chemicals	Organic dusts
Total number of workers in plants surveyed, 853									
Number of workers.....	606	399	328	151	122	69	60	81	28
Percent of workers exposed.....	71.0	46.8	33.5	17.7	14.3	8.1	7.0	3.6	3.3
Boiler makers	42	49	....	49	49	....	....	....	....
Car loaders	2	2	2	....	....	....	....	....	....
Cleaners .....	....	2	1	4	....	....	3	....	....
Compounders	40	26	....	25	....	14	....	....	....
Grease makers .....	....	....	12	....	....	25	25	....	....
Laborers	86	46	48	....	....	4	....	....	....
Mixers	25	4	7	5	....	4	5	....	....
Operators	95	28	88	....	20	2	7	....	19
Packers	15	....	18	....	....	10	1	....	....
Pipe fitters	86	74	....	....	....	....	....	....	....
Refiners .....	....	9	9	....	....	....	9	....	....
Still men	87	73	75	80	....	....	....	....	....
Supervisors	13	14	5	....	....	....	7	....	....
Technical men	28	13	21	....	....	....	....	26	....
Treaters	4	5	5	....	....	....	....	5	....
Truck drivers	11	6	9	....	....	....	....	....	....
Other	1	1	....	1	2	....	....	....	....
Maintenance	91	47	28	37	51	6	3	....	9

TABLE 20a — PAINT AND VARNISH — PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS — Concluded

Silicate dusts	Alcohols, esters and ethers	Other gases	Petroleum products	Chromium and its compounds	Manganese and its compounds	Alkaline compounds	Other chemicals	Silica dust	Organic acids	Benzol	Coal dust (bituminous)	Asbestos dusts	Mineral acids	Coal tar products	Antimony and its compounds	Sulfur	Sulfur dioxide
163	162	142	136	115	113	111	109	82	65	56	56	45	31	28	19	14	8
1.2	2.5	5.6	...	2.6	...	...	...	...	13.8	7.1	5.4	...	35.5	14.3	...	...	...
1.8	4.3	62.7	...	2.6	13.2	...	11.0	3.7	23.1	7.1	...	...	...	...	...	...	...
0.6	9.9	2.1	10.3	2.6	...	2.7	...	1.2	...	3.6	...	...	...	...	...	...	100
12.9	...	...	...	13.9	7.1	7.2	...	23.2	...	...	...	17.8	...	...	42.1	57.1	...
...	...	1.4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8.6	...	...	...	15.7	16.5	...	0.9	4.0	24.6	...	...	8.9	...	...	...	14.8	...
...
4.3	3.7	...	...	9.6	3.5	14.4	...	...	3.1	5.4	...	...	...	...	...	...	...

Materials for which no control measures were indicated are as follows: Dermatitis producers (70), Inks (57), Salts (18), Aniline and its compounds (8), Halogenated hydrocarbons (7), Aldehydes (3).

TABLE 21 — PETROLEUM PRODUCTS — EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS — Concluded

Non-silicious dusts	Coal dust (bituminous)	Paints and enamels	Benzol	Halogenated hydrocarbons	Asbestos dusts	Silica dust	Mineral acids	Lead and its compounds	Dermatitis producers	Silicate dusts	Sulfur	Salts	Organic acids	Chromium and its compounds	Lacquers and varnishes	Cyanides	Coal tar products
25	21	20	19	18	17	16	14	13	13	11	10	4	4	3	2	2	1
2.9	2.5	2.3	2.3	2.1	2.0	1.9	1.6	1.5	1.5	1.3	1.2	0.5	0.5	0.4	0.2	0.2	0.1
...
...
...
...	...	...	...	...	5	...	...	...	...	...	...	...	...	...	...	...	...
...	...	3	...	...	...	...	...	...	...	...	3	...	...	...	1	...	1
...	7	...	18	18	...	...	...	...	...	4	2	...	2	...	...	...	...
...	...	...	...	...	12	...	...	12	12	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	9	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	7	...	...	...	7	...	...	...	...	...	...	...
...	...	...	...	...	...	...	5	1	...	...	5	4	...	...	...	...	...
...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...
...
25	14	17	...	...	...	...	...	...	...	...	...	...	...	3	1	2	...

TABLE 21a — PETROLEUM PRODUCTS — PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Petroleum products										Other gases										Organic solvents										Carbon monoxide										Other metals										Oils, fats, and waxes										Alkaline compounds										Other chemicals										Organic dusts										Coal dust (bituminous)										Paints and enamels										Benzol										Halogenerated hydrocarbons										Sulfur										Organic acids										Lacquers and varnishes										Resinoids										Coal tar products																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																	
	606	399	328	151	122	69	60	31	28	21	20	19	18	10	4	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

Materials for which no control measures were indicated are as follows: Non-silicious dusts (25), Asbestos dusts (17), Silica dust (16), Mineral acids (14), Lead and its compounds (13), Dermatitis producers (13), Silicate dusts (11), Salts (4), and Chromium and its compounds (3).

Rayon (Tables 22 and 22a)

The principal exposure is hydrogen sulfide which is a well known by-product in the manufacture of rayon products. Carbon disulfide, also used in this process, is indicated under the classification of other solvents. Hydrogen sulfide as well as mineral acids is controlled 100% by positive general ventilation.

TABLE 22 — RAYON — EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Number of workers exposed to specified materials by occupation													
Total number of workers in plants surveyed, 117	Hydrogen sulfide	Mineral acids	Alkaline compounds	Petroleum products	Oils, fats, and waxes	Organic solvents	Other gases	Organic dusts	Cyanides	Salts	Other chemicals	Coal dust (bituminous)	Carbon monoxide
Number of workers exposed	41	37	23	21	21	16	11	9	7	7	5	4	4
Percent of workers exposed	35.0	31.6	19.7	17.9	17.9	13.7	9.4	7.7	6.0	6.0	4.3	3.4	3.4
Bleachers .....	...	...	6	...	...	...	6	...	6	6	...	...	...
Chemists .....	...	...	...	21	21	...	...	...	...	...	5	...	...
Coners .....	...	...	...	...	...	...	...	...	...	...	...	...	...
Floormen	4	...	...	...	...	...	...	...	...	...	...	...	...
Foremen	4	4	1	...	...	...	1	...	1	1	...	...	...
Laborers .....	...	...	9	...	...	9	...	9	...	...	...	...	...
Mechanics	4	4	...	...	...	...	...	...	...	...	...	...	...
Spinners	28	28	...	...	...	...	...	...	...	...	...	...	...
Tank men .....	...	...	5	...	...	3	...	...	...	...	...	...	...
Maintenance	1	1	4	...	...	4	4	...	...	...	...	4	...

TABLE 22a — RAYON — PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Hydrogen sulfide	Mineral acids	Alkaline compounds	Organic solvents	Other gases	Cyanides	Other chemicals	Carbon monoxide
Number of workers exposed.....	41	37	23	16	11	7	5	4
General positive ventilation.....	100	100	...	...	...	...	...	...
General negative ventilation.....	...	...	30.4	...	63.6	100	...	...
Local exhaust .....	...	...	...	56.3	...	...	100	100
Enclosure .....	...	...	13.0	75.0	36.4	...	...	...
Protective clothing .....	...	86.5	52.2	15.8	...	...	...	...

Materials for which no control measures were indicated are as follows: Petroleum products (21), Oils, fats, and waxes (21), Organic dusts (9), Salts (7), and Coal dust (bituminous) (4).

Soap Factories (Tables 23 and 23a)

The principal exposures, as would be expected, are alkaline compounds and oils. Exposure to alkaline compounds was indicated not only for workmen engaged in handling caustic raw materials, but also to workers exposed to soap dust itself. The non-specific occupation of operators is dominant in this group and includes employes in various departments. Enclosures and local exhausts are the principal means of control with respirators and protective clothing applied to certain exposures.

TABLE 23—SOAP FACTORIES—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation											
	Alkaline compounds	Oils, fats, and waxes	Dermatitis producers	Petroleum products	Other chemicals	Organic acids	Other gases	Carbon monoxide	Silicate dusts	Organic solvents	Inks	Mineral acids
Total number of workers in plants surveyed, 3,475												
Number of workers exposed....	956	446	382	225	177	173	153	142	111	110	87	75
Percent of workers exposed....	27.5	12.8	11.8	6.5	5.1	5.0	4.4	4.1	3.2	3.2	2.5	2.2
Assemblers .....	...	...	129	2	...	...	...	...	10	...	...	...
Bakers .....	...	...	20	...	...	...	22	20	...	...	...	...
Cleaners	76	31	...	...	...	...	...	...	...	9	...	...
Compounders .....	...	10	...	10	...	8	...	...	...	8	...	...
Cookers	26	30	2	4	...	...	...	3	...	...	...	6
Fillers	15	15	53	...	...	...	...	...	53	...	...	...
Glycerine makers	9	...	...	...	...	...	...	...	...	...	...	6
Laborers	64	64	2	22	4	63	12	1	20	27	...	23
Material handlers	28	12	...	...	...	...	...	...	8	...	...	...
Mixers	31	15	3	2	1	8	...	3	...	8	...	1
Operators	205	62	...	13	1	43	12	3	...	25	1	29
Packers	250	19	167	...	...	12	8	6	...	...	14	...
Pressmen	22	44	...	...	...	12	...	...	...	...	...	...
Printers .....	...	...	...	30	...	...	...	...	...	30	72	...
Pumpers	40	34	...	...	...	4	3	1	...	...	...	1
Receivers	2	2	1	...	...	4	...	...	...	...	...	...
Soap maker	65	51	...	1	...	2	57	21	12	2	...	...
Stampers	54	...	...	...	...	...	...	...	...	...	...	...
Stock keepers .....	...	15	...	...	...	...	...	...	...	...	...	...
Supervisors	24	20	...	...	10	17	11	7	...	8	...	9
Technical men	7	4	...	...	151	...	...	...	...	...	...	...
Truckers	26	...	5	...	...	...	...	...	...	...	...	...
Other	10	7	...	...	...	...	...	...	...	...	...	...
Maintenance	22	11	...	141	10	...	28	77	8	...	...	...

Blackings, Cleaners, etc. (Tables 24 and 24a)

Salts, alkaline compounds, organic dusts, and silicate dusts are the principal exposures in this group. These are well-known ingredients in many types of detergents. This group is comprised mainly of small establishments which are engaged in mixing and compounding raw chemicals, and, therefore, fillers, mixers, and packers are found to be the principal occupations. Local exhaust is the only significant control measure indicated.

TABLE 23—SOAP FACTORIES—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS—Concluded

Number of workers exposed to specified materials by occupation																	
Organic dusts	Silica dust	Dyes	Coal dust (bituminous)	Coal tar products	Salts	Lead and its compounds	Other metals	Paints and enamels	Benzol	Aldehydes	Alcohols, esters, and ethers	Infections	Lacquers and varnishes	Non-silicious dusts	Chromium and its compounds	Asbestos dusts	Fluorides
74	66	61	57	51	51	50	46	33	30	17	9	9	7	4	3	2	1
2.1	1.9	1.8	1.6	1.5	1.5	1.4	1.3	0.9	0.9	0.5	0.3	0.3	0.2	0.1	0.1	0.1	0.0
2	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	12	...	...	...	...	1	...	...	...	8	...	...	...	...	...	...	...
...	...	8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	6	...	6	...	...	...	...	...	...	...	12	...	...	...	...	...
...	...	...	...	...	...	...	...	11	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	6	...	...	...	...	...	...	...
13	26	...	6	2	16	...	...	...	...	...	2	2	...	...	...	...	...
...	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	1	11	...	13	2	...	...	2	...	3	3	...	5	...	...	...	1
12	10	6	1	7	6	...	16	...	...	...	...	...	...	...	3	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	30	...	...	30	...	...	...	...	...	...	...	...
4	...	10	...	...	2	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	10	2	...	...	...	...	...	2	...	2	...	...	...	...
4	1	20	...	13	22	...	...	...	...	...	2	...	...	...	...	...	...
...
...
6	1	...	...	...	...	...	2	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	5	...	...	...	...	...
...
6	...	...	50	...	...	20	28	20	...	...	...	...	...	4	...	2	...

TABLE 23a.—SOAP FACTORIES—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

[illegible]

Materials for which no control measures were indicated are as follows: Dermatitis producers (382), Inks (87), Coal dust (bituminous) (57), Lead and its compounds (50), Benzol (30), Infections (9), Chromium and its compounds (3), Asbestos dusts (2).

TABLE 24—BLACKINGS, CLEANERS, ETC.—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupations																	
	Salts	Alkaline compounds	Organic dusts	Silicate dusts	Dermatitis	Other gases	Organic solvents	Alcohols, esters, and ethers	Silica dust	Petroleum products	Oils, fats, and waxes	Dyes	Carbon monoxide	Inks	Laquers and varnishes	Coal dust (bituminous)	Other chemicals	Non-silicious dusts
Total number of workers in plants surveyed, 240	73	63	55	36	27	16	11	11	10	7	4	4	4	8	3	2	1	1
Number of workers exposed.....	30.4	26.3	22.9	15.0	11.3	6.7	4.6	4.6	4.2	2.9	1.7	1.7	1.7	1.8	1.3	0.8	0.4	0.4
Percent of workers exposed.....																		
Chemists .....	...	2	2	...	...	2	2	...	...	...	2	1	2	...	...	...	1	...
Compounders	33	4	87	10	14	...	2	7	4	...	...	...	...	...	...	...	...	...
Fillers	18	17	4	14	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Laborers	4	4	4	...	...	1	3	3	8	...	...	8	...	...	2	...	...	1
Mixers	12	26	...	12	...	7	...	...	...	7	...	...	...	...	...	...	...	...
Operators	6	7	2	...	18	6	1	1	...	...	...	...	1	8	1	1	...	...
Packers .....	...	3	...	...	...	...	3	...	3	...	2	...	...	...	...	...	...	...
Supervisors .....	...	...	6	...	...	...	...	...	...	...	...	...	1	...	...	1	...	...
Maintenance .....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

TABLE 24a—BLACKINGS, CLEANERS, ETC.—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Salts	Alkaline compounds	Organic dusts	Silicate dusts	Other gases	Organic solvents	Silica dust	Oils, fats, and waxes	Dyes	Carbon monoxide
Number of workers.....	73	63	55	36	16	11	10	4	4	4
Local exhaust	31.5	20.6	1.8	66.1	6.3	9.1	20.0	...	25.0	50.0
Enclosure .....	...	...	...	...	...	18.2	20.0	50.0	...	...
Wet method .....	...	...	1.8	...	...	...	40.0	...	...	...
Respirator .....	...	...	...	...	...	...	20.0	...	...	...
Protective clothing	1.4	11.1	...	...	...	18.2	...	50.0	25.0	...

Materials for which no control measures were indicated are as follows: Dermatitis producers (27), Alcohols, esters, and ethers (11), Petroleum products (7), Inks (3), Lacquers and varnishes (3), Coal dust (bituminous) (2), Other chemicals (1) and Non-silicious dusts (1).

Chemicals (as such) (Tables 25 and 25a)

The principal exposures are salts, other gases, alkaline compounds, and carbon monoxide. The group as a whole is represented by a diversity of manufacturing operations including such unrelated products as table salt and gas products. Here again, the non-specific occupations, laborers and operators, predominate. Some of the more specific types of occupations are related only to one particular type of industry. Control measures are so varied that no general conclusions may be drawn from this table without reference to the original surveys themselves.

TABLE 25.—CHEMICALS (AS SUCH)—EXPOSURE BY OCCUPATION
TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																		
	Salts	Other gases	Alkaline compounds	Carbon monoxide	Coal dust (bituminous)	Petroleum products	Non-silicious dusts	Other metals	Silicate dusts	Organic dusts	Mineral acids	Other chemicals	Lead and its compounds	Organic acids	Cadmium and its compounds	Silica dust	Coal tar products	Chromium and its compounds	Benzol
Total number of workers in plants surveyed, 2,910	983	813	637	623	424	373	361	237	224	131	122	102	95	57	55	59	44	43	40
Number of workers exposed.....	33.8	27.9	24.0	21.4	14.6	12.8	12.4	7.8	7.7	4.5	4.2	3.5	3.3	2.0	1.9	1.7	1.5	1.5	1.4
Percent of workers exposed.....	33.8	27.9	24.0	21.4	14.6	12.8	12.4	7.8	7.7	4.5	4.2	3.5	3.3	2.0	1.9	1.7	1.5	1.5	1.4
Bricklayers .....	...	...	...	...	...	...	...	...	21	...	11	...	...	...	...	17	...	...	...
Brines tenders	15	...	...	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...	...
Catalyzers	5	6	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...
Coopers .....	...	...	2	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...	...
Compressors	43	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Driers	11	...	5	...	...	5	...	...	...	...	...	...	...	...	...	...	...	...	...
Floormen .....	...	9	...	...	...	...	...	...	4	...	...	2	...	...	...	4	...	...	...
Fillers	1	...	...	...	...	...	...	...	2	13	...	...	...	...	...	2	...	...	...
Finishers .....	...	...	...	10	...	...	...	9	...	...	...	...	...	...	...	...	...	1	...
Furnace men .....	...	18	...	...	...	...	3	...	...	...	...	...	...	...	...	...	...	...	...
Generator chargers	6	...	...	71	35	130	32	42	159	...	17	...	27	16	42	4	...	39	...
Laborers	167	52	7	...	...	...	7	4	...	7	...	...	7	7	...	...	...	1	...
Mixers .....	...	...	...	11	...	...	...	...	...	...	11	...	...	...	...	...	...	...	...
Molders .....	...	11	...	...	...	...	...	...	...	...	...	...	...	...	...	8	...	...	32
Operators	610	577	665	369	303	17	258	33	8	12	77	...	...	3	...	...	32	...	...
Packers	24	6	...	...	...	...	...	1	...	...	...	...	...	5	...	...	...	...	...
Pan men .....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...
Platers .....	...	...	2	...	...	...	...	2	...	...	2	...	...	...	...	...	...	...	...
Pressman	6	11	...	...	...	6	...	...	...	...	...	...	...	4	...	...	...	...	...
Printers .....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Process men .....	...	25	...	35	...	...	...	5	...	...	5	...	5	20	5	...	...	6	...
Pumps	80	...	...	...	...	90	...	...	...	...	...	...	...	...	...	...	...	...	...
Shippers	4	3	...	...	...	...	1	...	...	...	5	7	...	...	...	...	...	...	...
Supervisors	10	1	10	5	8	...	...	4	2	2	...	...	4	...	...	1	...	...	...
Technical men	1	...	...	...	...	...	...	3	...	...	...	84	3	...	3	...	4	3	...
Truckers	6	13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Other	6	6	1	6	...	...	...	6	...	3	...	5	...	1	5	...	...	...	...
Maintenance	82	43	14	111	81	177	52	103	37	81	3	4	44	...	...	14	8	...	...

Dyestuffs, Inks (Tables 26 and 26a)

Dyes, mineral acids, salts, and chemicals are among the principal materials encountered in this group. Laborers and operators comprise the principal occupations. Local exhaust and protective clothing are extensively used for many exposures, while respirators and wet methods apply to some of the less prevalent materials.

Matches (Tables 27 and 27a)

It will be noted that a large percentage of workers are exposed to a variety of important materials. The percentage of workers exposed to dangerous amounts of such materials is doubtless less than the potential exposures indicated in these tables. The control measure table shows a relatively small percentage of workers protected by enclosure methods, but examination of the original surveys reveals that this control exists where the degree of exposure is conceded to be the greatest, as in mixing.

TABLE 25a—CHEMICALS (AS SUCH)—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Number of workers exposed to specified materials											
	Salts	Other gases	Alkaline compounds	Carbon monoxide	Coal dust (bituminous)	Non-silicious dusts	Other metals	Silicate dusts	Organic dusts	Mineral acids	Other chemicals	
Number of workers.....	983	813	697	623	424	361	227	224	131	122	102	
General positive ventilation.....	...	0.6	...	0.8	...	...	6.6	...	...	...	...
General negative ventilation.....	0.3	10.7	...	11.7	...	1.9	39.2	5.8	19.1	9.8	...	
Local exhaust	0.4	15.5	2.9	79.9	14.2	6.1	27.8	6.7	6.1	11.5	64.7	
Enclosure	43.9	66.9	49.2	4.5	...	7.5	9.7	...	0.8	39.3	2.0	
Wet method .....	...	...	...	...	...	1.9	1.8	...	...	...	...
Gas Mask .....	...	4.9	...	...	...	...	...	...	...	...	5.9
Respirator .....	...	...	...	...	...	0.6	7.5	0.9	...	...	6.8
Protective clothing	1.0	...	1.5	...	...	2.1	12.8	...	13.7	1.6	8.8

TABLE 26—DYESTUFFS, INKS—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation									
	Dyes	Mineral acids	Salts	Dermatitis producers	Other chemicals	Organic solvents	Organic dusts	Coal tar products	Lead and its compounds	Other metals
Total number of workers in plants surveyed, 521										
Number of workers exposed.....	319	227	215	214	175	103	102	100	100	64
Percent of workers exposed.....	61.2	43.6	41.3	41.0	33.6	19.8	19.6	19.2	19.2	12.3
Compounders	3	...	...	...	...	...	4	...	8	3
Cookers .....	...	...	...	34	...	...	...	...	...	...
Coopers .....	...	...	...	...	2	...	1	...	...	...
Grinders	3	...	...	...	...	3	...	...	...	...
Ice makers .....	...	...	...	...	...	5	...	...	...	...
Laborers	139	160	125	144	...	38	37	60	27	...
Matchers .....	...	...	...	...	...	...	...	...	...	...
Millers	21	...	...	...	...	...	16	...	21	21
Mixers	6	...	...	...	...	...	1	...	1	1
Operators	51	35	47	...	...	38	39	35	39	39
Pressmen	3	3	3	3	...	...	...	...	...	...
Supervisors	57	26	27	33	38	4	1	5	7	...
Technical men	35	...	13	...	137	15	...	...	...	...
Other .....	...	...	...	...	1	...	...	...	...	...
Maintenance	1	3	...	...	2	...	3	...	2	...

TABLE 25a—CHEMICALS (AS SUCH)—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS—Concluded

Lead and its compounds	Organic acids	Cadmium and its compounds	Silicia dust	Coal tar products	Chromium and its compounds	Benzol	Sulfur dioxide	Sulfur	Organic solvents	Alcohols, esters, and ethers	Halogenated hydrocarbons	Aldehydes	Lacquers and varnishes	Antimony and its compounds	Paints and enamels	Oils, fats, and waxes	Amines	Arsenic and its compounds	Cyanides
95	57	55	50	44	43	40	39	38	29	27	26	18	17	17	16	15	12	12	2
33.7	...	58.2	...	27.3	74.4	30.0	7.5	...	13.8	48.1	46.2	...	...	17.6	...	...	...	...	...
3.2	...	36.4	4.0	27.3	14.0	30.0	5.1	2.6	51.7	44.4	53.8	66.7	...	52.9	18.8	...	100	100	...
3.2	3.5	5.5	...	72.7	7.0	30.0	71.8	...	10.3	55.6	46.2	...	...	...	...	20.0	100	100	140
...	...	...	...	...	2.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	27.3	...	30.0	...	...	...	...	7.7	...	...	...	...	...	...	100	...
5.3	...	9.1	...	...	20.9	...	...	5.3	...	...	...	...	...	...	18.8	...	...	...	...
...	12.3	...	...	...	4.7	...	...	18.4	...	...	34.6	61.1	11.8	41.1	12.5	...	...	...	...

Materials for which no control measures were indicated are as follows: Petroleum products (373), Inks (14), Temperature change (7), Accelerators (7), Aniline compounds (7) and Dermatitis producers (1).

TABLE 26—DYESTUFFS, INKS—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS—Concluded

Coal dust (bituminous)	Chromium and its compounds	Other gases	Sulfur	Alkaline compounds	Aldehydes	Aniline and its compounds	Silicia dust	Alcohols, esters, and ethers	Oils, fats, and waxes	Halogenated hydrocarbons	Organic acids	Inks	Petroleum products	Carbon monoxide	Silicate dusts	Lacquers and varnishes	Manganese and its compounds	Non-silicious dusts	Medicinals
57	55	53	51	49	47	47	39	38	37	35	35	28	26	22	16	14	5	4	1
10.9	10.6	10.2	9.8	9.4	9.0	9.0	7.5	7.3	7.1	6.7	6.7	5.4	5.2	4.2	3.2	2.7	1.0	0.8	0.2
...	14	3	...	...	...	...	...	...	3	...	...	...	3	3	...	...	...	...	...
...	...	...	...	...	...	...	...	...	3	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	6	...	...	3	...	...	...	3	...	...	...
54	...	...	3	...	...	...	...	...	...	...	...	...	6	16	16	...	...	...	...
...	6	...	...	...	...	...	...	...	18	...	...	11	21	...	...	...	4	...	...
...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	9	...	1	...
...	35	48	47	47	47	47	38	38	7	35	35	1	...	...	...	...	...	3	...
...	...	...	1	1	...	...	...	...	1	...	...	...	...	...	...	1	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	3	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	...	1	1	...	1
3	...	2	...	...	...	...	...	...	...	...	...	1	1	2	...	...	...	...	...

TABLE 26a — DYESTUFFS, INKS — PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Dyes																Inks				Petroleum products				Carbon monoxide				Non-silicious dusts			
	319	327	215	214	175	103	102	100	100	64	57	55	53	51	49	39	37	28	26	22	22	26	26	22	22	22	22	22	22	22	22	4
Local exhaust	65.2	63.9	66.0	...	65.7	16.5	2.9	37.0	1.0	1.6	...	...	7.5	7.8	...	2.6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Enclosure	0.3	12.3	...	...	...	...	1.0	...	1.0	1.6	...	...	22.6	...	...	2.6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Wet method	0.9	...	...	...	...	...	2.9	...	8.0	4.8	...	5.5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Respirator	6.0	...	...	...	17.7	...	1.9	...	4.0	1.6	49.1	...	...	...	...	2.6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Protective clothing	67.4	76.7	73.0	92.5	56.6	1.9	2.9	37.0	3.0	4.8	...	5.5	...	7.8	4.1	...	8.1	39.3	4.6	...	...	...	...	...	...	...	...	...	...	...	...	...

Materials for which no control measures were indicated are as follows: Aldehydes (47), Aniline and its compounds (47), Alcohols, esters, and ethers (38), Halogenated hydrocarbons (35), Organic acids (35), Silicate dusts (16), Lacquers and varnishes (14), Manganese and its compounds (5), and Medicinals (1).

TABLE 27 — MATCHES — EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																					
	Organic dusts	Other metals	Silicate dusts	Phosphorus and its compounds	Antimony and its compounds	Chromium and its compounds	Sulfur	Non-silicious dusts	Salts	Petroleum products	Dermatitis producers	Inks	Carbon monoxide	Sulfur dioxide	Other gases	Lead and its com- pounds	Alkaline compounds	Coal dust (bituminous)	Mineral acids	Dyes	Silica dust	Paints and enamels
Total number of workers in plants surveyed, 940																						
Number of workers.....	614	569	510	500	509	507	498	334	304	77	66	43	14	9	9	8	5	5	2	2	2	1
Percent of workers exposed.....	65.3	60.5	54.3	54.1	54.1	53.9	53.0	35.5	32.3	8.2	7.0	4.6	1.5	1.0	1.0	0.9	0.5	0.5	0.2	0.2	0.2	0.1
Bakers.....	8	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...
Box makers.....	6	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...
Chemists.....	...	1	1	1	1	1	1	1	4	...	...	...	...	...	...	...	...	...	...	...	...	...
Gaugers.....	4	4	4	4	4	4	4	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Labors.....	36	36	...	36	36	36	36	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mixers.....	19	19	19	19	19	19	19	19	19	...	...	...	...	...	...	...	...	...	...	...	...	...
Operators.....	400	310	292	310	310	310	310	292	292	...	29	...	6	...	6	...	...	...	...	...	2	...
Painters.....	2	2	2	2	2	2	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Panners.....	8	8	8	8	8	8	8	8	8	...	...	...	...	...	...	...	...	...	...	...	...	...
Packers.....	123	120	120	120	120	120	120	...	...	...	13	87	...	...	...	...	...	...	...	...	...	...
Pressmen.....	...	1	1	1	1	1	1	...	...	...	...	6	...	...	...	1	...	...	...	...	...	...
Supervisors.....	4	1	1	1	1	1	1	8	1	2	...	...	...	8	...	...	...	...	...	...	...	...
Testers.....	...	8	8	8	8	8	8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Other.....	1	1	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Maintenance.....	10	59	55	...	...	...	...	...	...	73	4	...	8	...	3	7	6	5	2	2	...	...

TABLE 27a—MATCHES—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Organic dusts	Other metals	Silicate dusts	Phosphorus and compounds	Antimony and its compounds	Chromium and its compounds	Sulfur	Non-silicious dusts	Salts	Carbon monoxide	Other gases
Number of workers exposed	614	569	510	509	509	507	498	334	304	14	9
General negative ventilation	48.9	52.7	58.8	58.9	58.9	59.1	60.2	89.8	98.7	...	...
Local exhaust .....	...	...	...	...	...	...	...	...	...	78.6	66.7
Enclosure	8.8	9.5	...	9.5	9.5	9.6	10.8	...	...	...	...
Wet method .....	...	0.2	...	...	...	...	...	0.3	...	...	...
Protective clothing .....	...	0.2	...	...	...	...	...	...	...	...	...

Materials for which no control measures were indicated are as follows: Petroleum products (77), Dermatitis producers (96), Inks (43), Sulfur dioxide (9), Lead and its compounds (8), Alkaline compounds (5), Coal dust (bituminous) (5), Mineral acids (2), Dyes (2), Silica dust (2), and Paints and enamels (1).

Patent Medicines and Drugs (Tables 28 and 28a)

Medicinals and chemicals comprise the principal exposures in the patent medicine and drug industries. Other minor exposures are well distributed with occupations such as fillers, compounders, packers, mixers, and operators predominating. The major exposures, medicinals and chemicals, include practically everything listed in the U. S. Pharmacopeia. The term, medicinals, was applied arbitrarily in this survey particularly to potent drugs, whereas other chemicals include such substances as salts and common organic chemicals. Local exhausts, enclosures, and respirators are the important methods of control and are applied to a wide variety of exposures.

Other Chemicals (Tables 29 and 29a)

The principal exposure in this group is coal tar products which concerns workers in the wood creosoting and shingle staining industries. As noted in the appendix, this group includes all chemical industries not classified above and is therefore greatly diversified. The control measures, as well as exposures and occupations, are varied and have no special meaning to the group as a whole.

TABLE 28a—PATENT MEDICINES, DRUGS—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Materials															
	Medicinals	Other chemicals	Organic dusts	Oils, fats, and waxes	Alkaline compounds	Coal tar products	Petroleum products	Other metals	Salts	Silicate dusts	Non-silicious dusts	Carbon monoxide	Mineral acids	Other gases	Chromium and its compounds	Silica dust
Number of workers exposed	313	265	130	55	40	39	37	35	31	25	18	13	9	4	2	1
General negative ventilation	8.0	3.8	...	...	...	7.7	...	...	...	...	...	...	...	...	...	...
Local exhaust	11.8	11.7	8.5	3.6	5.6	...	5.4	5.7	12.9	...	11.1	61.5	11.1	...	...	...
Enclosure	0.6	0.3	1.5	3.6	...	...	...	37.1	...	69.1	...	7.7	...	25.0	100	100
Respirator	5.1	7.3	0.8	...	...	...	...	37.1	...	59.1	...	...	11.1	...	...	100
Protective clothing	3.3	10.9	...	3.6	...	...	...	...	9.7	...	...	...	...	...	...	...

Materials for which no control measures were indicated are as follows: Dermatitis producers (141), Inks (35), Organic solvents (46), Organic acids (42), Alcohols, esters, and ethers (39), Lead and its compounds (32), Coal dust (bituminous) (9), Dyes (6), Halogenated hydrocarbons (5), Amines (4), Manganese and its compounds (3), Benzol (3) and Infections (2).

TABLE 28—PATENT MEDICINES, DRUGS—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Number of workers exposed to specified materials by occupation												
Occupations	Medicinals	Other chemicals	Dermatitis producers	Organic dusts	Inks	Oils, fats, and waxes	Organic solvents	Organic acids	Alkaline compounds	Alcohols, esters, and ethers	Coal tar products	Petroleum products
Total number of workers in plants surveyed, 890												
Number of workers exposed ...	313	265	141	130	55	55	46	42	40	39	39	37
Percent of workers exposed ...	35.2	29.8	15.8	14.6	6.2	6.2	5.2	4.7	4.5	4.4	4.4	4.2
Assemblers	78	80	80	81	...	...	...	...	...	...	...	...
Chemists	17	21	...	3	...	...	3	3	...	3	3	2
Compounders	8	...	...	6	...	4	2	2	6	2	4	...
Distillers	4	4	...	...	...	...	...	...	1	...	...	...
Fillers	70	42	5	4	...	30	14	14	17	14	17	15
Grinders	3	...	...	3	...	...	...	...	...	...	...	...
Inspectors	4	...	...	...	...	4	...	...	...	...	...	4
Labelers .....	...	...	12	...	...	...	4	4	6	4	...	...
Laborers	9	7	5	11	...	...	...	3	...	...	2	5
Mixers	9	11	...	...	...	2	4	1	1	6	...	4
Operators	10	12	8	13	5	6	5	8	4	4	4	3
Packers	27	22	25	4	13	1	4	4	...	...	4	...
Pharmacists	29	27	...	...	...	2	2	2	2	6	2	2
Preparers	2	2	...	...	...	...	...	...	...	...	...	...
Printers .....	...	...	...	...	36	...	5	...	...	...	...	...
Sealers .....	...	...	2	...	...	...	...	...	...	...	...	...
Supervisors	7	7	1	1	...	5	1	1	...	1	1	...
Tablet makers	22	21	...	1	...	...	...	...	...	...	...	...
Technicians	2	1	...	...	...	...	...	...	...	...	2	...
Weighers	2	2	...	...	...	...	...	...	...	...	...	...
Other	2	2	...	...	1	1	2	...	2	...	...	1
Maintenance	9	4	3	3	...	...	...	...	1	...	...	...

TABLE 29—OTHER CHEMICALS—EXPOSURE BY OCCUPATION
TO SPECIFIED MATERIALS

Number of workers exposed to specified materials by occupation											
Occupations	Coal tar products	Organic dusts	Oils, fats, and waxes	Carbon monoxide	Coal dust (bituminous)	Other metals	Petroleum products	Other chemicals	Silicate dusts	Dermatitis producers	Dyes
Total number of workers in plants surveyed, 658											
Number of workers exposed.....	191	99	82	66	59	45	41	33	30	29	28
Percent of workers exposed.....	29.0	15.0	12.5	10.0	9.0	6.8	6.0	5.0	4.6	4.4	4.3
Chemists	9	...	...	...	...	...	...	20	4	...	...
Dippers	5	...	19	...	...	14	...	...	...	...	5
Drivers	10	...	...	...	...	...	...	...	...	...	...
Fillers .....	...	...	1	...	...	...	2	...	...	6	...
Formers .....	...	5	...	...	...	...	...	...	...	...	...
Grinders	1	2	...	1	...	8	...	...	...	...	1
Kettlemen .....	...	...	3	...	...	...	...	...	...	...	...
Labelers .....	...	6	6	...	...	6	...	6	...	...	6
Laborers	104	1	1	22	22	1	22	2	...	1	4
Loaders .....	...	8	...	...	...	...	...	...	...	...	...
Mixers	4	4	7	...	...	7	3	4	7	4	4
Operators	10	21	1	3	...	...	...	...	7	1	3
Packers	5	...	...	...	...	...	...	...	...	16	...
Polishers	2	2	...	...	...	...	...	...	...	...	...
Pressers	9	2	...	7	7	2	...	...	...	...	2
Pressmen .....	...	...	16	...	...	...	...	...	...	...	...
Printers .....	...	...	...	...	...	...	...	...	...	...	...
Shippers	4	8	2	...	...	...	...	...	2	...	...
Strippers .....	...	...	14	...	...	...	...	...	...	...	...
Supervisors .....	...	3	5	...	...	1	...	1	...	1	1
Treaters	15	9	...	...	...	...	...	...	...	...	...
Washers .....	...	2	2	...	...	...	...	...	...	...	...
Other	2	1	...	...	...	...	...	...	...	...	1
Maintenance	11	25	5	23	30	11	14	...	10	...	1

TABLE 29—OTHER CHEMICALS—EXPOSURE BY OCCUPATION
TO SPECIFIED MATERIALS—Concluded

Number of workers exposed to specified materials by occupation															
Alkaline compounds	Chromium and its compounds	Alcohols, esters, and ethers	Lead and its compounds	Aldehydes	Organic solvents	Paints and enamels	Other gases	Mineral acids	Non-silicious dusts	Halogenated hydrocarbons	Organic acids	Lacquers and varnishes	Inks	Asbestos dusts	Sulfur dioxide
25	20	20	18	18	17	16	14	12	10	5	5	4	4	3	1
3.8	3.0	3.0	2.7	2.7	2.6	2.4	2.1	1.8	1.5	0.8	0.8	0.6	0.6	0.5	0.2
...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...
...	14	...	14	...	5	...	...	...	...	...	...	...	...	...	...
...
...
...	...	1	...	1	...	...	...	...	3	...	1	...	...	...	1
...	1	...	...	...	...	...	1	...	...	...	...
6	...	6	...	6	...	...	...	6	...	3	...	...	...	...	...
1	...	2	...	1	...	...	...	1	...	1	...	...	...	...	...
...
8	6	5	4	5	...	...	...	4	4	...	1	2	...	3	...
...	3	...	...	...	...	1	...	...	...	...	...
...	10	...	...	...	...	...	...	...	...	...
...	2	...	...	...	...	...	...
...	...	2	...	2	...	...	...	...	...	...	2	...	...	...	...
...
...	4	...	...	...	...	...	...	...	4	...	...
...	...	2	...	2	2	...	...	...	...	...	...	...	...	...	...
...
1	...	1	...	1	...	...	4	1	1	...	...	...	...	...	...
...
2
...	1
7	2	...	10	...	...	...	...	2	...	...	...

TABLE 29a.—OTHER CHEMICALS—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures																													
		Coal tar products		Organic dusts		Oils, fats, and waxes		Carbon monoxide		Other metals		Petroleum products		Other chemicals		Silicate dusts		Dyes		Chromium and its compounds		Lead and its compounds		Other gases		Non-silicious dusts		Lacquers and varnishes	
Number of workers exposed		191	99	99	82	66	45	41	33	30	28	20	18	14	10	4													
General negative ventilation		2.6	3.0	...	...	...	35.6	...	...	23.3	...	80.0	88.9	...	...	...										
Local exhaust		2.1	41.4	...	7.3	86.4	...	53.7	18.2	...	...	...	...	28.6	30.0	50.0										
Enclosure		15.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Wet method		...	4.0	...	...	...	8.9	...	...	...	17.9	...	...	...	30.0	...										
Respirator		...	4.0	...	...	...	...	...	...	13.8	...	...	...	...	...	...							
Protective clothing		25.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Materials for which no control measures were indicated are as follows: Coal dust (bituminous) (59), Dermatitis producers (29), Alkaline compounds (25), Alcohols, esters and ethers (20), Aldehydes (18), Organic solvents (17), Paints and enamels (16), Mineral acids (12), Halogenated hydrocarbons (6), Organic acids (6), Inks (4), Asbestos dusts (3) and Sulfur dioxide (1).

TABLE 30—CIGARS AND TOBACCO—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation													
	Organic dusts	Dermatitis producers	Organic solvents	Petroleum products	Non-silicious dusts	Other metals	Other gases	Carbon monoxide	Alcohols, esters, and ethers	Coal dust (bituminous)	Silica dusts	Alkaline compounds	Silicate dusts	Salts
Total number of workers in plants surveyed, 2567														
Number of workers exposed	2289	76	72	38	17	17	13	10	7	3	5	4	1	1
Percent of workers exposed	89.2	3.0	2.8	1.5	0.7	0.7	0.5	0.4	0.3	0.2	0.2	0.2	0.0	0.0
Cigar makers	392	21	...	...	...	...	...	...	...	...	...	...	...	...
Cutters	141	...	2	...	...	...	...	...	...	...	...	...	...	...
Dippers	12	5	12	...	...	...	...	...	7	...	...	...	...	...
Feeders	...	...	12	...	...	...	...	...	...	...	...	...	...	...
Labelers	30	1	...	...	...	...	...	...	...	...	...	...	...	...
Labors	62	...	17	...	...	...	...	...	...	...	...	...	...	...
Mixers	...	9	...	...	...	...	...	...	...	...	...	...	...	...
Operators	160	27	1	...	...	...	4	...	...	...	4	4	1	1
Oven tenders	...	...	...	...	...	...	4	...	...	...	...	...	...	...
Packers	94	13	28	...	...	...	...	...	...	...	...	...	...	...
Sorters	45	...	...	...	...	...	...	...	...	...	4	...	...	...
Tipplers	21	...	...	...	...	...	5	...	...	...	...	...	...	...
Maintenance	84	...	...	38	17	17	...	6	...	...	1	...	1	...

The following occupations are exposed to organic dusts only: Bench makers (12), Bookkeepers (1), Breakers (5), Cartoners (4), Carriers (3), Casers (8), Clerks (33), Coopers (13), Drivers (3), Executives (3), Fillers (73), Floor ladies (12), Floor men (311), Fluffing men (1), Foremen (141), Graders (2), Inspectors (69), Porters (1), Rollers (189), Sprayers (3), Stampers (9), Steamers (10), Strippers (78), Superintendents (184) and Weighers (186).

Cigars and Tobacco (Tables 30 and 30a)

The striking exposure in the manufacture of cigars and tobacco is organic dusts and refers specifically to tobacco dust in this industry. Tobacco workers exposed to organic dusts comprise 89.2% of the total. Everyone working in the vicinity where tobacco was handled was given an exposure to organic dusts. Control measures are not employed to any significant degree.

TABLE 30a—CIGARS AND TOBACCO—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Organic dusts	Organic solvents	Other metals	Other gases	Carbon monoxide	Silica dust
Number of workers exposed	2,289	72	17	13	10	5
General negative ventilation	0.7	....	....	....	....	80.0
Local exhaust	2.5	....	....	61.5	10.0	80.0
Enclosure .....	....	2.8	....	30.7	40.0	....
Wet method .....	....	....	5.9	....	....	20.0

Materials for which no control measures were indicated are as follows: Dermatitis producers (76), Petroleum products (38), Non-silicious dusts (17), Alcohols, esters and ethers (7), Coal dust (bituminous) (6), Alkaline compounds (4), Silicate dusts (1) and Salts (1).

CLAY, GLASS, AND STONE

Table 31 indicates the number and percentage of total exposures to the specified materials in each division of the clay, glass, and stone group. Silica and silicate dusts, carbon monoxide, and other gases are the principal exposures.

TABLE 31—CLAY, GLASS AND STONE—EXPOSURE TO SPECIFIED MATERIALS

Number of workers exposed to specified materials	Materials	Number and Percentage of Total Exposures to the Specified Materials in Each Industrial Subdivision																	
		Brick and tile				Glass factories		Glass mirrors		Lime, cement and artificial stone		Marble and stone yards		Potteries		Asphalt and roofing materials		Other clay, glass and stone	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
10,472	Silicate dusts	3,643	34.8	1,233	11.8	98	0.9	934	9.1	160	1.5	3,987	38.1	112	1.1	285	2.7	1.1	1.1
9,010	Silica dust	3,560	39.5	1,249	3.9	14	0.2	913	6.9	375	4.2	3,940	43.8	48	0.5	97	1.1	1.7	1.7
2,998	Carbon monoxide	1,335	35.2	1,426	37.6	5	0.1	174	4.6	34	0.9	711	18.7	41	1.1	67	1.1	1.7	1.5
3,993	Other gases	317	12.2	1,338	52.3	13	0.5	202	7.8	36	1.4	617	23.7	17	0.7	38	1.5	1.5	1.5
1,899	Non-silicic dusts	38	2.0	459	24.2	61	3.2	592	31.2	151	8.0	330	17.4	24	1.3	244	12.8	12.8	12.8
1,517	Lead and its compounds	41	2.7	1,099	72.4	11	0.8	6	0.4	...	...	343	22.6	9	0.6	8	0.5	6.5	6.5
1,507	Other metals	88	5.8	440	29.2	24	1.6	45	3.0	14	0.9	869	57.7	13	0.9	14	0.9	14	0.9
1,417	Temperature change	15	1.1	1,373	96.9	...	...	26	1.8	...	...	...	...	...	...	3	0.2	3	0.2
1,210	Coal dust (bituminous)	763	64.7	40	4.1	1	0.1	180	14.9	32	2.6	78	6.4	35	2.9	42	4.3	4.3	4.3
929	Petroleum products	240	26.5	281	30.2	2	0.2	104	11.2	12	1.3	98	10.5	154	16.3	82	8.4	8.4	8.4
764	Alkaline compounds	67	8.8	404	56.5	6	0.8	179	23.4	...	...	70	9.2	12	1.6	6	0.8	0.8	0.8
578	Organic dusts	92	15.9	244	35.3	15	2.6	45	7.8	...	...	99	17.1	55	9.5	68	11.8	11.8	11.8
558	Paints and enamels	2	0.4	231	41.9	18	3.2	8	1.4	...	...	282	50.5	7	1.3	7	1.3	1.3	1.3
365	Organic solvents	4	1.1	230	60.3	23	6.3	11	3.0	1	0.3	94	25.8	12	3.3	...	...	...	...
339	Lacquers and varnishes	7	2.1	149	44.0	10	2.9	21	6.2	...	...	145	42.8	2	0.6	5	...	...	...
155	Oils, fats and waxes	13	8.4	48	31.0	9	5.8	3	1.9	1	0.6	55	35.5	14	9.0	12	7.7	7.7	7.7
...	Manganese and its compounds	121	19.3	49	34.8	...	...	...	...	...	...	73	31.8	...	...	...	...	...	...
123	Salts	22	18.0	91	71.1	6	4.7	1	0.8	...	...	...	...	1	0.8	6	4.7	4.7	4.7
120	Coal tar products	3	2.5	96	80.0	...	...	...	...	...	...	...	...	21	17.5	...	...	...	...
119	Chromium and its compounds	5	4.2	50	42.0	...	...	...	...	...	...	59	49.6	5	4.2	...	...	...	...
118	Asbestos dusts .....	...	...	6	5.1	...	...	...	...	...	...	...	...	60	50.8	52	44.1	44.1	44.1
99	Mineral acids .....	...	...	65	65.7	30	30.3	...	...	...	...	4	4.0	...	...	...	...	...	...
71	Fluorides .....	...	...	69	97.2	2	2.8	...	...	...	...	...	...	...	...	...	...	...	...
65	Dermatitis producers	23	35.4	10	15.4	5	7.7	5	7.7	8	12.3	8	12.3	8	4.6	3	4.6	4.6	4.6
58	Other chemicals	2	3.4	16	27.6	7	12.1	18	31.0	...	...	5	8.6	9	15.5	1	1.7	1.7	1.7
55	Arsenic and its compounds .....	...	...	55	100.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...
49	Selenium and its compounds	49	100.0	49	100.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...
47	Sulfur	47	100.0	47	100.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...
46	Antimony and its compounds	46	100.0	46	100.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34	Alcohols, esters and ethers	34	100.0	34	100.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...
28	Inks	28	100.0	28	100.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	Infections	23	100.0	23	100.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	Core gases	13	100.0	13	100.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11	Benzol	11	100.0	11	100.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10	Organic acids	10	100.0	10	100.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8	Dyes	8	100.0	8	100.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6	Cyanides	6	100.0	6	100.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5	Cadmium and its compounds	5	100.0	5	100.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...

TABLE 32 — BRICK AND TILE — EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																						
	Silicate dusts	Silica dusts	Carbon monoxide	Coal dust (bituminous)	Other gases	Petroleum products	Organic dusts	Other metals	Alkaline compounds	Lead and its compounds	Non-silicious dusts	Salts	Dermatitis producers	Infections	Manganese and its compounds	Temperature change	Oils, fats, and waxes	Lacquers and varnishes	Chromium and its compounds	Organic solvents	Coal tar products	Other chemicals	Paints and enamels
Total number of workers in plants surveyed, 4,797																							
Number of workers exposed.....	3,643	3,560	1,385	783	817	246	92	88	67	41	38	23	23	23	19	15	13	7	5	4	3	2	2
Percent of workers exposed.....	75.9	74.2	27.8	16.3	6.6	5.1	1.9	1.8	1.4	0.9	0.8	0.5	0.5	0.5	0.4	0.3	0.3	0.1	0.1	0.1	0.1	0.0	0.0
Bricklayers	27	27	1	1	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Drillers	17	17	15	..	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Drivers	87	84	5	19	16	1	..	2	..	..	..	..	7	7	..	..	..	..	..	..	..	..	..
Drawers	316	316	257	12	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Fireman	67	35	475	465	20	..	..	..	..	..	..	22	..	..	7	15	..	..	..	..	..	..	..
Finishers	147	147	..	..	..	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Glazers	29	29	..	..	..	..	..	16	..	8	5	..	..	..	4	..	..	..	4	..	..	..	..
Hackers	217	217	3	3	..	15	1	..	..	8	8	..	..	..	..	..	..	..	..	..	..	..	..
Kiln setters	488	488	38	6	8	..	1	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..
Labors	355	339	60	111	12	..	22	2	29	..	..	14	14	14	..	..	..	..	..	..	..	..	..
Loaders	141	138	16	6	82	..	8	4	..	4	..	..	..	..	4	..	..	..	..	..	..	..	..
Miners	225	233	87	15	125	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Molders	183	183	5	..	..	15	18	..	7	..	6	..	..	..	..	..	..	..	..	..	..	..	..
Operators	92	89	..	1	4	55	3	4	..	2	2	..	1	1	2	..	10	..	..	..	8	..	..
Pan men	154	155	2	2	10	24	3	15	27	1	5	..	..	..	..	..	..	..	..	..	..	..	..
Puggers	132	132	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Pressmen	144	144	..	..	..	7	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Pit men	98	98	4	10	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Scalers	11	11	..	2	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..
Screen men	32	32	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Shippers	51	36	..	..	..	..	10	1	..	1	3	..	..	..	..	..	..	..	1	..	..	..	..
Supervisors	62	62	5	9	..	3	..	4	3	..	..	1	1	1	2	..	..	..	..	..	..	..	..
Transfer men	173	178	4	4	..	7	..	3	..	4	..	..	..	..	..	..	..	..	..	..	..	..	..
Wheeler	311	311	216	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Other	16	16	..	..	..	..	9	2	..	3	6	..	..	..	..	..	..	..	..	..	..	..	..
Maintenance	63	43	142	118	35	112	17	83	..	8	1	..	..	..	..	..	3	7	..	4	..	..	..

Brick and Tile (Tables 32 and 32a)

Silica and silicate dusts, carbon monoxide, and bituminous coal dust constitute the principal exposures. Both free silica and silicates are present in Ohio clays. The Ohio Geological Survey, Bulletin 26, shows that free silica is present in many Ohio clays to the extent of 30%. However, it is not necessarily contended that the concentration of air-borne dust from such materials would approach 30% free silica. The carbon monoxide exposures arise from the fuel used in the burning of clay products. Kiln drawers have been known to be asphyxiated by carbon monoxide, and such exposures were therefore given to this occupation. The kiln firemen were also given carbon monoxide exposures with local exhaust as a control measure. The positive ventilation controls specified in these industries are associated primarily with mines on the premises of the brick plants from which clay and coal are obtained. Wet methods were credited to processes where the raw materials are used in a plastic state.

TABLE 32a—BRICK AND TILE—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Silicate dusts	Silica dust	Carbon monoxide	Coal dust	Other gases	Petroleum products	Other metals	Lead and its compounds	Non-silicious dusts	Coal tar products
Number of workers exposed.....	3,643	3,560	1,335	783	317	246	83	41	38	3
General positive ventilation.....	7.0	7.1	5.8	3.8	63.4	....	....	....	....	....
General negative ventilation.....	0.0	0.1	....	....	....	....	....	....	....	....
Local exhaust	1.6	1.5	46.1	....	14.5	....	8.0	....	....	....
Enclosure	0.5	0.5	....	....	....	....	....	....	....	....
Wet method	22.6	23.2	....	3.8	....	....	12.5	14.6	18.4	....
Respirator	1.3	0.8	....	....	....	....	6.8	....	....	100
Protective clothing .....	....	....	....	....	....	0.8	15.9	7.3	....	....

Materials for which no control measures were indicated are as follows: Organic dusts (92), Alkaline compounds (67), Salts (23), Dermatitis producers (23), Infections (23), Manganese and its compounds (19), Temperature change (15), Oils, fats, and waxes (13), Lacquers and varnishes (7), Chromium and its compounds (5), Organic solvents (4), Other chemicals (2) and Paints and enamels (2).

Glass Factories (Tables 33 and 33a)

Included in glass factories are a variety of operations such as mixing, milling, glass molding, decorating and grinding. Important exposures are carbon monoxide, temperature change, other gases, silicate dusts, and lead. Lead is encountered in both mixing of ingredients and glass decoration. General negative ventilation, local exhaust, wet grinding, and respirators are the principal means of control.

TABLE 33.—GLASS FACTORIES — EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation															
	Carbon monoxide	Temperature change	Other gases	Silicate dusts	Lead and its compounds	Non-silicious dusts	Other metals	Alkaline compounds	Silica dust	Petroleum products	Paints and enamels	Organic solvents	Organic dusts	Lacquers and varnishes	Coal tar products	Salts
Total number of workers in plants surveyed, 7,265																
Number of workers exposed.....	1,426	1,373	1,358	1,233	1,099	459	440	424	349	251	254	220	204	149	96	91
Percent of workers exposed.....	19.6	18.9	18.7	17.0	15.1	6.3	6.1	5.8	4.8	3.9	3.2	3.0	2.8	2.1	1.3	1.3
Assemblers.....	...	...	...	6	...	...	...	...	...	8	...	...	5	5	90	...
Benders.....	13	...	13	...	...	...	...	...	13	...	...	...	...	...	...	...
Blowers.....	...	...	...	...	60	...	...	...	...	...	...	...	...	...	...	...
Carry in boys.....	65	65	65	...	65	...	...	...	10	...	...	...	...	...	...	...
Chemists.....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Crack off boys.....	32	32	32	...	28	...	...	...	...	...	...	...	...	...	...	...
Cutters.....	...	...	...	...	...	64	...	...	7	...	...	17	...	...	...	...
Decorators.....	30	...	30	86	181	...	144	...	...	...	88	146	5	139	6	...
Engravers.....	11	...	...	77	...	2	2	...	...	...	...	...	...	...	...	...
Ethers.....	...	...	11	...	...	...	...	6	...	...	...	12	...	...	...	...
Examiners.....	...	...	...	...	...	24	...	24	...	...	...	...	...	...	...	...
Feeders.....	116	110	116	...	...	...	...	...	...	...	...	...	...	...	...	...
Fill men.....	16	...	16	16	...	16	16	16	16	...	...	...	16	...	...	16
Finishers.....	24	16	27	47	16	...	6	...	...	...	...	...	...	...	...	...
Furnace men.....	76	125	76	17	118	...	11	57	57	...	1	...	...	...	...	...
Gatherers.....	149	149	149	5	146	...	...	5	5	...	...	...	...	...	...	...
Glaziers.....	34	8	27	...	7	...	...	...	...	...	...	...	...	...	...	...
Grinders.....	...	...	...	219	4	46	4	...	76	...	4	2	...	...	...	...
Laborers.....	40	57	43	21	4	56	4	56	6	15	...	...	...	...	...	2
Layers.....	...	...	...	...	...	56	...	56	...	...	...	...	...	...	...	...
Lehr tenders.....	39	14	49	...	...	...	...	...	...	...	...	...	...	...	...	...
Melters.....	14	...	14	14	...	14	14	14	14	...	...	...	14	...	...	14
Mirrors.....	...	...	...	...	...	...	6	...	...	...	...	...	...	2	...	...
Mixers.....	...	...	...	39	5	19	18	50	36	...	...	...	11	...	...	16
Molders.....	9	105	...	9	...	...	9	...	...	30	...	...	...	...	...	...
Operators.....	143	138	149	323	141	...	...	...	12	51	137	2	50	...	...	3
Polishers.....	26	...	26	108	...	38	93	...	...	45	...	27	46	...	...	...
Pressers.....	91	188	91	111	...	11	...	8	3	...	...	...	...	...	...	...
Sand blasters.....	...	...	...	19	...	11	5	...	...	...	...	...	...	...	...	...
Sealers.....	...	...	...	20	...	...	...	...	18	...	...	...	...	...	...	...
Setters.....	22	22	22	...	44	...	...	...	...	21	...	...	...	...	...	...
Shippers.....	36	...	36	36	...	...	...	...	...	...	...	...	...	...	...	...
Shop boys.....	240	240	240	...	...	...	...	...	...	...	...	...	44	...	...	...
Strippers.....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Supervisors.....	6	...	...	8	...	64	...	40	3	...	...	...	...	...	...	...
Truckers.....	...	...	...	...	...	...	...	...	3	...	...	...	...	...	...	...
Unloaders.....	...	...	...	...	...	14	...	14	14	...	...	...	...	...	...	...
Washers.....	...	...	...	...	...	15	...	...	22	...	...	...	...	...	...	...
Other.....	14	12	14	28	2	5	...	55	...	10	16	...	...	...	...	...
Maintenance.....	159	61	112	81	46	15	108	...	34	99	5	14	10	8	...	...

TABLE 33 — GLASS FACTORIES — EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS — Concluded

Occupations	Number of workers exposed to specified materials by occupation																
	Fluorides	Mineral acids	Arsenic and its compounds	Chromium and its compounds	Coal dust (bituminous)	Manganese and its compounds	Selenium and its compounds	Oils, fats, and waxes	Antimony and its compounds	Sulfur	Inks	Other chemicals	Dermatitis producers	Asbestos dust	Alcohols, esters, and ethers	Cadmium and its compounds	Cyanides
Total number of workers in plants surveyed, 7,265	69	65	55	50	49	49	49	48	41	41	22	16	10	6	5	5	1
Number of workers exposed.....	69	65	55	50	49	49	49	48	41	41	22	16	10	6	5	5	1
Percent of workers exposed.....	0.9	0.9	0.8	0.7	0.7	0.7	0.7	0.7	0.6	0.6	0.3	0.2	0.1	0.1	0.1	0.1	0.0
Assemblers .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	12	.....	5	.....	.....	.....	.....
Benders .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Blowers .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	8	.....
Carry in boys.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	16	.....	.....	.....	.....	.....
Chemists .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Crack off boys.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6	.....	.....	.....	.....	.....	.....
Cutters .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Decorators .....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....
Engravers .....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Etchers	17	5	.....	.....	.....	.....	.....	10	.....	.....	.....	.....	.....	.....	.....	.....	.....
Examiners .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Feeders .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Fill men	16	.....	16	16	.....	16	16	.....	16	16	.....	.....	.....	.....	.....	.....	.....
Finishers .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Furnace men .....	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Gatherers .....	.....	.....	6	.....	.....	.....	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Glaziers .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Grinders .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Laborers	2	.....	.....	7	.....	7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Layers .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lehr tenders .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Melters	14	.....	14	14	.....	14	14	22	14	14	.....	.....	.....	.....	.....	.....	.....
Mirrors .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mixers	13	.....	15	11	.....	11	12	.....	11	11	.....	.....	.....	.....	.....	.....	.....
Molders .....	.....	.....	.....	.....	.....	.....	.....	4	.....	.....	.....	.....	.....	6	.....	.....	.....
Operators .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Polishers	8	39	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Pressers	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sand blasters .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sealers .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Setters .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Shippers .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	8	.....	.....	.....	.....
Shop boys .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Strippers .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Supervisors	1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Truckers .....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Unloaders .....	.....	.....	.....	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....
Washers .....	.....	16	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Other .....	.....	.....	2	2	.....	1	2	8	.....	.....	.....	.....	2	.....	.....	.....	.....
Maintenance .....	.....	4	.....	48	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

TABLE 33a—GLASS FACTORIES—PERCENTAGE OF EXPOSED
WORKERS PROVIDED WITH CONTROL MEASURES
FOR SPECIFIED MATERIALS

Control Measures	Carbon monoxide	Temperature change	Other gases	Silicate dusts	Lead and its compounds	Non-silicious dusts	Other metals
Number of workers exposed.....	1,426	1,373	1,358	1,233	1,009	459	440
General positive ventilation.....	....	....	....	16.1	....	5.2	5.6
General negative ventilation.....	37.1	....	36.0	36.1	62.7	....	24.5
Local exhaust	10.0	....	7.4	6.1	12.7	....	46.4
Enclosure	3.8	....	....	0.6	2.5	....	....
Wet method .....	....	....	....	46.5	0.5	36.6	7.9
Respirator .....	....	....	....	2.5	6.6	2.4	17.0
Protective clothing .....	....	0.6	....	....	....	....	....

Glass Mirrors (Tables 34 and 34a)

The principal exposures, silicate and non-silicious dusts, are chiefly due to grinding and polishing operations. General negative ventilation and wet grinding are the chief means of control.

TABLE 33a—GLASS FACTORIES—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS—Concluded

Alkaline compounds	Silica dust	Paints and enamels	Organic solvents	Organic dusts	Lacquers and varnishes	Coal tar products	Salts	Fluorides	Mineral acids	Arsenic and its compounds	Chromium and its compounds	Manganese and its compounds	Selenium and its compounds	Coal dust (bituminous)	Oils, fats, and waxes	Sulfur	Antimony and its compounds
424	349	234	220	204	149	96	91	69	65	55	50	49	49	49	48	41	41
...	...	...	8.6	11.8	...	...	...	...	...	...	...	...	...	...	16.7	...	...
...	24.9	74.8	89.1	38.7	...	...	...	11.6	...	...	...	...	...	...	...	...	...
2.8	12.6	0.4	63.2	2.9	93.3	6.3	3.3	80.4	12.3	...	16.0	16.3	...	23.6	...	...	...
12.5	13.8	...	...	...	...	...	39.6	...	...	...	...	...	...	...	...	...	...
4.8	33.2	...	...	9.3	...	...	...	...	...	...	...	...	...	...	...	...	...
9.2	11.2	...	29.1	5.4	42.9	...	18.7	15.9	...	14.5	22.0	...	38.8	...	...	26.8	26.8
0.9	...	...	...	...	...	...	...	10.1	9.2	...	...	...	...	...	...	...	...

Materials for which no control measures were indicated are as follows: Petroleum products (281), Inks (22), Other chemicals (16), Dermatitis producers (10), Asbestos dusts (6), Cadmium and its compounds (5), Alcohols, ester, and ethers 5) and Cyanides (1).

TABLE 34a—GLASS MIRRORS—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Silicate dusts	Non-silicious dusts	Mineral acids	Other metals	Organic solvents	Alcohols, esters, and ethers	Organic dusts	Silica dust	Other gases	Lacquers and varnishes	Carbon monoxide
Number of workers exposed.....	98	61	30	24	23	19	15	14	13	10	6
General positive ventilation.....	...	...	10.0	12.5	39.1	...	...	...	...	20.0	...
General negative ventilation.....	27.6	32.8	20.0	25.0	39.1	47.4	...	50.0	23.1	30.0	...
Local exhaust	15.3	14.8	10.0	12.5	...	...	...	14.3	...	10.0	20.0
Enclosure	2.0	...	10.0	12.5	...	...	...	14.3	...	...	...
Wet method.....	69.4	91.8	...	...	...	...	33.3	64.3	...	...	...
Respirator	3.1	3.3	...	...	...	...	...	21.4	...	10.0	...

Materials for which no control measures were indicated are as follows: Paints and enamels (18), Lead and its compounds (11), Organic acids (10), Oils, fats, and waxes (9), Other chemicals (7), Alkaline compounds (6), Salts (6), Dermatitis producers (5), Fluorides (2), Inks (2), Petroleum products (2) and Coal dust (bituminous) (1).

TABLE 34—GLASS MIRRORS—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																						
	Silicate dusts	Non-silicious dusts	Mineral acids	Other metals	Organic solvents	Alcohols, esters, and ethers	Paints and enamels	Organic dusts	Silica dusts	Other gases	Lead and its compounds	Organic acids	Lacquers and varnishes	Oils, fats, and waxes	Other chemicals	Alkaline compounds	Salts	Dermatitis producers	Carbon monoxide	Fluorides	Inks	Petroleum products	Coal dust (bituminous)
Total number of workers in plants surveyed, 218	98	61	30	24	23	19	18	15	14	13	11	10	10	9	7	6	6	5	5	5	2	2	1
Number of workers exposed	45.0	23.0	13.8	11.0	10.6	8.7	8.3	6.9	6.4	6.0	5.0	4.6	4.6	4.1	3.2	2.8	2.8	2.3	2.3	0.9	0.9	0.9	0.5
Percent of workers exposed																							
Artists	..	..	2	..	4	2	3	1	..	2	..	..	2	..	..	..	..	..	..	2	..	..	..
Bevelers	14	10	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Blasters	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Cleaners	15	11	8	..	3	13	..	..	..	..	..	..	..	..	3	..	..	..	..	..	..	..	..
Engravers	13	..	..	..	..	..	..	..	7	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Fitters	..	..	..	..	..	..	..	5	..	..	..	..	..	..	..	..	..	5	..	..	..	..	..
Glaziers	..	..	..	11	6	..	9	1	..	2	11	..	..	9	..	..	..	..	2	..	..	..	..
Mirror makers	10	..	2	3	2	..	2	1	..	..	..	..	3	1	..	..	..	..	..	..	..	..	..
Operators	16	13	..	..	..	..	..	2	..	..	..	..	..	..	..	6	..	..	..	..	..	..	..
Packers	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Polishers	20	22	..	..	..	..	..	3	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Pourers	..	..	4	..	4	..	4	..	..	4	..	4	4	..	..	..	4	..	..	..	..	..	..
Silverers	3	3	8	10	3	3	..	1	..	5	..	6	..	..	3	..	2	..	..	..	..	..	..
Other	1	1	..	..	1	1	..	1	..	..	..	..	..	..	1	..	..	..	1	..	2	..	..
Maintenance	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..

Total number of workers
in plants surveyed, 218

TABLE 35.—LIME, CEMENT, AND ARTIFICIAL, STONE—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																		
	Silicate dusts	Silica dust	Non-silicious dusts	Other gases	Coal dust (bituminous)	Alkaline compounds	Carbon monoxide	Petroleum products	Other metals	Organic dusts	Temperature change	Laquers and varnishes	Other chemicals	Organic solvents	Paints and enamels	Lead and its compounds	Dermatitis producers	Oils, fats, and waxes	Salts
Total number of workers in plants surveyed, 1,778																			
Number of workers exposed.....	954	618	592	202	180	179	174	104	45	45	26	21	12	11	8	6	5	3	1
Percent of workers exposed.....	53.7	34.8	33.3	11.4	10.1	10.1	9.8	5.8	2.5	2.5	1.5	1.2	1.0	0.6	0.4	0.3	0.3	0.2	0.1
Baggers	63	...	9	...	...	4	...	...	...	...	...	...	...	...	...	...	...	...	...
Burners	25	13	16	5	12	...	13	4	...	...	6	...	...	...	...	...	...	...	...
Casters	35	42	17	1	2	25	...	...	1	...	...	...	...	...	...	...	2	...	...
Cement makers	7	9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Chemists	15	...	1	...	...	4	...	...	...	...	...	...	14	...	...	...	...	...	...
Cleaners	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Decorators .....	...	...	...	...	...	...	...	...	...	11	...	2	...	11	...	...	...	...	...
Dippers	1	...	1	...	...	1	5	...	...	...	...	3	...	...	...	...	...	...	...
Driers	6	6	6	...	6	...	6	...	...	...	...	...	...	...	...	...	...	...	...
Feeders	5	...	5	5	5	...	5	...	...	...	...	...	...	...	...	...	...	...	...
Grinders	48	37	51	...	13	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Laborers	288	299	145	12	17	82	8	17	3	3	3	7	...	...	7	...	...	2	...
Material men	6	6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Miners	3	64	54	...	30	...	5	...	...	...	...	...	...	...	...	...	...	...	...
Mixers	140	28	4	...	...	1	...	...	...	1	...	...	...	...	...	...	...	...	...
Molders	55	53	...	...	...	2	...	...	...	...	...	2	...	...	...	...	1	...	...
Operators	40	83	120	27	9	47	18	7	...	9	13	...	4	...	...	...	...	...	...
Pit men	5	3	6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pullers .....	...	...	9	...	...	9	9	...	...	...	...	...	...	...	...	...	...	...	...
Supervisors	27	19	19	8	2	6	1	2	2	...	2	1	...	...	...	...	...	...	...
Track men	2	1	15	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Truck drivers	58	44	21	...	...	7	...	...	...	...	...	...	...	...	...	...	...	...	...
Unloaders	3	...	...	...	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...
Vault builders	18	13	5	...	...	...	...	8	...	8	...	...	...	...	...	...	...	...	...
Warehouse men	8	...	1	...	...	1	...	1	...	1	...	...	...	...	...	...	2	...	...
Wood workers .....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Other	9	8	8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...
Maintenance	117	18	83	71	83	89	96	57	39	7	2	6	...	...	1	6	...	...	...

Lime, Cement, and Artificial Stone (Tables 35 and 35a)

Silica, silicate, and non-silicious dusts are again the dominant exposures. These materials are important in concrete work and cement manufacture which comprise the principal manufacturing operations in this group. Wet methods, which are inherent in concrete work, and general negative ventilation and local exhaust, which are used extensively in some important cement manufacturing operations, are the principal control measures.

TABLE 35a—LIME, CEMENT, AND ARTIFICIAL STONE—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Silicate dusts	Silica dust	Non-silicious dusts	Other gases	Coal dust (bituminous)	Alkaline compounds	Carbon monoxide	Petroleum compounds	Other metals	Organic dusts	Other chemicals
Number of workers exposed.....	954	618	502	202	180	179	174	104	45	45	18
General positive ventilation.....	...	...	12.7	24.8	16.7	...	...	...	...	...	...
General negative ventilation.....	4.0	6.1	18.3	47.0	8.3	...	8.6	...	...	20.0	...
Local exhaust	1.3	...	2.4	19.8	...	1.1	57.5	...	...	...	83.3
Enclosure	0.2	...	2.4	...	...	3.9	...	...	...	...	...
Wet method	9.6	14.2	3.5	...	...	1.7	...	...	...	...	...
Respirator	0.7	0.6	2.7	...	...	3.9	...	...	...	...	...
Protective clothing	1.4	...	...	...	...	3.9	...	1.0	26.7	...	...
Other	0.1	0.2	...	...	...	0.6	...	...	...	...	...

Materials for which no control measures were indicated are as follows: Temperature change (26), Lacquers and varnishes (21), Organic solvents (11), Paints and enamels (8), Lead and its compounds (6), Dermatitis producers (5), Oils, fats, and waxes (3) and Salts (1).

Marble and Stone Yards (Tables 36 and 36a)

The principal exposures in this group are silica, silicate, and non-silicious dusts. These are encountered in the grinding and finishing of various types of stone. All these processes show some degree of control by exhaust methods, enclosures, wet methods, and respirators.

TABLE 36—MARBLE AND STONE YARDS—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation										
	Silica dust	Silicate dusts	Non-silicious dusts	Other gases	Carbon monoxide	Coal dust (bituminous)	Other metals	Petroleum products	Dermatitis producers	Oils, fats, and waxes	Organic solvents
Total number of workers in plants surveyed, 524											
Number of workers exposed.....	375	160	151	36	34	32	14	12	8	1	1
Percent of workers exposed.....	71.6	30.5	28.8	6.9	6.5	6.1	2.7	2.3	1.5	0.2	0.2
Crane men	19	...	...	...	...	...	...	...	...	...	...
Cutters	91	56	47	2	...	...	...	...	1	...	1
Draftsmen	3	3	3	...	...	...	...	...	3	...	...
Drillers .....	...	...	3	...	...	...	...	...	...	...	...
Inspectors	3	3	3	...	...	...	...	...	...	...	...
Laborers	111	24	15	16	...	...	1	...	...	...	...
Operators	24	13	21	...	...	...	...	...	1	...	...
Planers	21	...	...	...	...	...	...	...	...	...	...
Polishers	22	29	28	...	...	...	10	...	...	1	...
Quarry hands	21	...	...	15	...	...	...	...	...	...	...
Sand blasters	13	11	9	...	...	...	...	...	3	...	...
Sawyers	20	4	7	...	...	...	...	...	...	...	...
Slabbers	3	3	3	...	...	...	...	...	...	...	...
Supervisors	13	4	2	...	...	...	...	...	...	...	...
Truck drivers	3	3	1	...	...	...	...	...	...	...	...
Other .....	...	1	3	...	...	...	...	...	...	...	...
Maintenance	3	6	6	3	34	32	3	12	...	...	...

TABLE 36a—MARBLE AND STONE YARDS—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Silica dust	Silicate dusts	Non-silicious dusts	Carbon monoxide	Other metals
Number of workers exposed.....	375	160	151	34	14
General negative ventilation.....	4.0	8.8	7.3	....	50.0
Local exhaust	9.3	13.1	9.3	91.2	....
Enclosure	6.9	16.3	10.6	....	....
Wet method	26.1	44.4	55.6	....	64.3
Respirator	10.4	9.4	7.3	....	....
Protective clothing	3.7	0.6	1.3	....	....

Materials for which no control measures were indicated are as follows: Other gases (36), Coal dust (bituminous) (32), Petroleum products (12), Dermatitis producers (8), Oils, fats, and waxes (1), and Organic solvents (1).

TABLE 37—POTTERIES—EXPOSURE TO SPECIFIED MATERIALS

Number of workers exposed to specified materials by occupation									
Occupations	Silicate dusts	Silica dust	Other metals	Carbon monoxide	Other gases	Lead and its compounds	Non-silicious dusts	Paints and enamels	Lacquers and varnishes
Total number of workers in plants surveyed, 5,088									
Number of workers exposed.....	3,987	3,949	869	711	617	343	330	282	145
Percent of workers exposed.....	79.1	78.4	17.2	14.1	12.2	6.8	6.6	5.6	2.9
Batters	27	27	...	...	...	...	...	...	...
Bench workers	16	16	...	...	...	14	...	...	2
Blungers	188	179	12	...	...	...	...	...	...
Carriers	213	213	22	3	3	...	...	...	...
Casters	259	259	...	...	...	...	3	...	...
Cleaners	23	23	9	...	...	...	...	...	...
Decal girls	145	145	23	100	100	3	...	...	125
Decorators	149	147	243	...	...	45	3	235	12
Dippers	218	218	200	...	...	94	133	...	...
Finishers	575	575	81	14	14	26	14	...	...
Glaze makers	15	18	10	...	...	42	27	...	...
Glazers	84	88	77	...	...	41	9	...	...
Grinders	32	32	...	...	...	...	8	...	...
Hand clay workers.....	12	12	...	...	...	...	3	...	...
Handle men	23	23	...	...	...	...	...	...	...
Jigger men	412	412	...	3	3	...	...	...	...
Kiln operators	62	62	...	98	71	...	...	...	...
Kiln setters	580	580	40	410	399	...	...	3	...
Laborers	67	67	4	...	...	...	6	...	...
Molders	36	37	4	3	3	...	...	...	...
Mold makers .....	...	...	...	...	...	...	98	...	...
Operators	82	76	33	1	1	21	...	...	...
Pressmen	205	205	...	...	...	...	...	...	...
Printers	36	36	2	...	...	...	...	31	...
Saggermen	85	35	...	...	...	...	...	...	...
Selectors	212	212	...	3	3	28	...	...	...
Shippers	94	85	...	5	5	...	...	...	...
Sprayers	50	47	45	...	...	2	...	11	...
Stock men	29	29	...	...	...	...	...	...	...
Supervisors	15	15	...	2	2	...	...	...	...
Technical men	20	19	20	...	...	21	...	...	...
Tile cutters	50	50	...	...	...	...	...	...	3
Truckers	19	19	...	...	...	...	...	...	...
Other	20	21	16	6	2	4	...	2	3
Maintenance	39	37	23	63	11	2	26	...	...

Potteries (Tables 37 and 37a)

Silica and silicate materials, which make up the body of pottery ware, and other metals and lead, which are important components in glaze materials, are the important exposures in the pottery industry. Carbon monoxide and other gases are encountered in the burning and processing of the ware. Wet methods, an integral part of the process, are indicated as an important method of control. If care is not exercised, dusty conditions may arise from the dried silica and silicate materials which were originally in a wet condition.

TABLE 37—POTTERIES—EXPOSURE TO SPECIFIED MATERIALS
—Concluded

[illegible]

Asphalt and Roofing Materials (Tables 38 and 38a)

Petroleum and silicate dusts dominate this group, and control measures apply to a relatively small percentage of the workers.

TABLE 37a.—POTTERIES—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Dyes													
	3	4	4	5	5	13	59	70	73	99	282	330	343	3
Number of workers exposed.....	3,987	3,949	869	711	617	343	330	282	99	73	70	59	13	3
Silicate dusts	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Silica dust	4.9	5.0	5.1	4.0	6.6	11.7	8.5	0.3	12.1	14.1	17.1	20.3	15.4	100.0
Other metals	4.7	4.8	13.0	62.0	58.7	14.9	11.2	3.9	14.1	14.1	17.1	20.3	15.4	100.0
Carbon monoxide	1.9	1.5	5.4	11.0	12.6	11.4	0.6	0.6	45.2	45.2	1.4	1.4	1.4	100.0
Other gases	43.6	42.0	41.6	..	..	59.5	50.0	..	2.7	2.7	4.3	8.8	..	66.7
Lead and its compounds	1.6	1.3	1.0	..	..	1.5	0.6	..	..	..	..	..	..	..
Non-silicious dusts	0.1	0.1	..	..	..	1.2	0.9	..	..	..	..	..	..	..
Paints and enamels	0.1	0.1	..	..	..	1.2	0.9	..	..	..	..	..	..	..
Organic dusts	0.1	0.1	..	..	..	1.2	0.9	..	..	..	..	..	..	..
Manganese compounds	0.1	0.1	..	..	..	1.2	0.9	..	..	..	..	..	..	..
Alkaline compounds	0.1	0.1	..	..	..	1.2	0.9	..	..	..	..	..	..	..
Chromium and its compounds	0.1	0.1	..	..	..	1.2	0.9	..	..	..	..	..	..	..
Core gases	0.1	0.1	..	..	..	1.2	0.9	..	..	..	..	..	..	..
Antimony and its compounds	0.1	0.1	..	..	..	1.2	0.9	..	..	..	..	..	..	..
Mineral acids	0.1	0.1	..	..	..	1.2	0.9	..	..	..	..	..	..	..
Cyanides	0.1	0.1	..	..	..	1.2	0.9	..	..	..	..	..	..	..

Materials for which no control measures were indicated are as follows: Lacquers and varnishes (145), Petroleum products (98), Organic solvents (94), Coal dust (bituminous) (78), Oils, fats, and waxes (55), Alcohols, esters, and ethers (10), Dermatitis producers (8), Sulfur (6), Other chemicals (5), and Inks (3).

TABLE 38a—ASPHALT AND ROOFING MATERIALS—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Petroleum products	Silicate dusts	Asbestos dusts	Silica dust	Carbon monoxide	Non-silicious dusts	Other gases	Oils, fats, and waxes	Other metals	Organic solvents	Lead and its compounds	Dyes	Lacquers and varnishes
Number of workers exposed	154	112	60	48	41	24	17	14	13	12	9	5	2
General negative ventilation	...	0.9	8.3	2.1	...	4.2	...	28.6	...	...	44.4	80.0	...
Local exhaust.....	...	...	...	...	65.9	...	11.8	...	...	8.3	...	...	100
Enclosure	3.9	0.9	...	...	...	...	5.8	...	...	25.0	...	...	...
Wet method.....	...	4.5	...	...	...	...	...	...	38.5	...	...	...	...
Respirator	0.6	4.5	...	16.7	...	...	...	...	...	...	...	...	...
Protective clothing.....	3.3	0.9	...	2.1	...	...	...	...	7.7	...	...	...	...

Materials for which no control measures were indicated are as follows: Organic dusts (55), Coal dust (bituminous) (35), Coal tar products (21), Alkaline compounds (12), Benzol (11), Other chemicals (9), Paints and enamels (7), Chromium and its compounds (5), Dermatitis producers (3), Inks (1), and Salts (1).

Other Clay, Glass, and Stone (Tables 39 and 39a)

Slag materials and gypsum products are the prevalent representatives in this group. Silicate dust is dominant in slag plants and non-silicious dust in gypsum plants. The control measures are featured by local exhaust and wet methods applying principally to the gypsum factories.

TABLE 39—OTHER CLAY, GLASS, AND STONE—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																			
	Silicate dusts	Non-silicious dusts	Silica dust	Organic dusts	Carbon monoxide	Asbestos dusts	Coal dust (bituminous)	Other gases	Petroleum products	Other metals	Oils, fats, and waxes	Lead and its compounds	Paints and enamels	Alkaline compounds	Salts	Lacquers and varnishes	Dermatitis producers	Temperature change	Other chemicals	Cyanides
Total number of workers in plants surveyed, 700																				
Number of workers exposed.....	285	244	97	63	67	52	52	38	32	14	12	8	7	6	6	5	3	3	1	1
Percent of workers exposed.....	40.2	34.4	13.7	9.6	9.4	7.3	7.3	5.4	4.5	2.0	1.7	1.1	1.0	0.8	0.8	0.7	0.4	0.4	0.1	0.1
Assemblers	..	..	..	..	..	..	..	..	..	6	..	..	..	..	..	..	2	..	..	..
Burners	..	1	..	..	4	..	5	..	..	..	..	..	..	..	..	..	..	..	..	..
Cutters	1	5	..	8	..	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Drillers	..	..	..	..	5	..	..	5	..	..	..	..	..	..	..	..	..	..	..	..
Feeders	5	5	..	3	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
Finishers	10	12	..	6	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Glazers	..	..	..	..	12	..	..	12	..	..	..	..	..	..	..	..	..	..	..	..
Inspectors	..	..	..	..	..	3	..	9	..	..	..	..	..	..	..	..	..	8	..	..
Kiln tenders	4	5	2	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Laborers	6	6	..	..	5	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..
Locomotive men	6	..	..	..	8	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..
Mill men	12	..	8	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..
Miners	6	80	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Mixers	7	15	6	10	..	8	..	..	6	6	..	6	6	6	..	..	..	..	..	..
Molders	16	30	8	5	5	..	5	5	..	..	..	..	..	..	..	..	..	..	..	..
Operators	59	46	29	9	1	16	..	..	..	..	..	..	..	..	..	8	1	..	..	..
Packers	11	6	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Puddlers	..	3	..	3	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..
Screeners	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Sealers	16	16	16	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Slitters	13	5	8	6	..	16	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Shippers	8	7	7	..	..	7	..	..	1	..	..	..	..	..	..	..	..	..	..	..
Supervisors	4	9	3	1	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..
Other	1	4	1	..	2	..	..	2	1	..	..	2	..	..	..	..	..	..	1	..
Maintenance	22	14	3	4	31	..	28	5	22	2	..	..	1	..	3	1	..	..	..	1

TABLE 39a—OTHER CLAY, GLASS, AND STONE—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Silicate dusts	Non-silicious dusts	Silica dust	Organic dusts	Carbon monoxide	Asbestos dusts	Coal dust (bituminous)	Other gases	Other metals	Paints and enamels	Alkaline compounds	Lacquers and varnishes
Number of workers exposed....	285	244	97	68	67	52	52	38	14	7	6	5
General positive ventilation....	...	11.9	1.0	...	10.4	...	3.8	13.2	14.3	...	...	...
General negative ventilation....	9.5	...	27.8	...	4.5	...	...	7.9	...	...	...	...
Local exhaust	5.3	27.0	34.0	35.3	70.1	80.8	...	39.5	...	100.0	100.0	...
Enclosure	1.4	4.9	4.1	...	...	...	...	...	...	...	...	60.0
Wet method	8.5	14.3	...	36.8	...	...	...	...	...	...	...	...
Respirator	1.4	...	4.1	...	...	...	...	...	...	35.7	...	80.0

Materials for which no control measures were indicated are as follows: Petroleum products (32), Oils, fats, and waxes (12), Lead and its compounds (8), Salts (6), Dermatitis producers (3), Temperature change (3), Other chemicals (1), and Cyanides (1).

CLOTHING

As indicated in Table 40, organic dusts is the important exposure in this major industry. This dust was indicated for cutters and others working near dusty operations. A small percentage of carbon monoxide and other gas exposures is noted in ironing and pressing operations and a limited amount of solvents in cleaning and spotting processes. A group of anomalous exposures, such as cyanides, lead, and mineral acids, is noted in the minor sub-group of men's clothing. These were found in plants engaged in the incidental manufacture of jewelry and lodge regalia. General negative ventilation is the only significant control measure noted for the clothing industries. Tables 41 to 47 inclusive show a detailed occupational analysis for each sub-division of this major group.

TABLE 40 — CLOTHING — EXPOSURE TO SPECIFIED MATERIALS

Materials	Number of workers exposed to specified materials	Number and Percentage of Total Exposures to the Specified Materials in Each Industrial Subdivision													
		Gloves		Hats and caps		Shirts, collars and cuffs		Suits, coats and overalls		Women's light clothing		Fur goods		Other clothing	
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Organic dusts.....	2,225	469	21.1	109	4.9	89	4.0	646	29.0	716	32.2	123	5.5	73	3.3
Carbon monoxide.....	920	8	1.4	89	40.6	5	2.3	86	39.1	37	16.8	....	....	....	....
Other gases.....	194	5	2.6	72	37.1	1	0.5	74	38.1	42	21.6	....	....	....	....
Petroleum products.....	121	....	....	24	19.8	8	6.6	36	31.5	61	50.4	....	....	2	1.7
Other metals.....	47	3	6.4	....	....	....	....	39	83.0	5	10.6	....	....	....	....
Inks.....	43	15	34.9	3	7.0	4	9.3	14	32.6	5	11.6	....	....	2	4.7
Non-silicious.....	37	....	....	24	64.9	1	2.7	12	32.4	....	....	....	....	....	....
Silica dust.....	33	....	....	29	87.9	1	3.0	3	9.1	....	....	....	....	....	....
Organic solvents.....	33	8	24.2	3	9.1	1	3.0	8	24.2	12	36.4	....	....	1	3.0
Dermatitis producers.....	30	1	3.3	2	6.7	2	6.7	23	76.7	1	3.3	....	....	1	3.3
Alkaline compounds.....	25	6	24.4	....	....	1	3.6	16	67.1	5	17.9	....	....	....	....
Coal dust (bituminous).....	20	3	15.0	1	5.0	5	25.0	11	55.0	....	....	....	....	....	....
Lacquers and varnishes.....	15	5	33.3	8	53.3	....	....	2	13.3	....	....	....	....	....	....
Oils, fats and waxes.....	14	2	14.3	9	64.3	....	....	3	21.4	....	....	....	....	....	....
Lead and its compounds.....	13	....	....	....	....	1	7.7	9	69.2	3	23.1	....	....	....	....
Silicate dusts.....	12	3	25.0	....	....	....	....	4	33.3	5	41.7	....	....	....	....
Dyes.....	11	....	....	....	....	4	36.4	4	36.4	3	27.3	....	....	....	....
Halogenated hydrocarbons.....	11	....	....	....	....	2	18.2	3	27.3	....	....	6	54.5	....	....
Mineral acids.....	8	....	....	....	....	....	....	8	100.0	....	....	....	....	....	....
Salts.....	8	....	....	....	....	3	37.5	....	....	5	62.5	....	....	....	....
Mercury and its compounds.....	6	....	....	6	100.0	....	....	....	....	....	....	....	....	....	....
Paints and enamels.....	6	....	....	....	....	1	16.7	3	50.0	2	33.3	....	....	....	....
Cyanides.....	5	....	....	....	....	....	....	5	100.0	....	....	....	....	....	....
Alcohols, esters and ether.....	2	....	....	....	....	....	....	1	50.0	....	....	....	....	1	50.0
Coal tar products.....	1	....	....	....	....	....	....	....	....	....	....	1	100.0	....	....

TABLE 41—GLOVES—EXPOSURE BY OCCUPATION
TO SPECIFIED MATERIALS

Number of workers exposed to specified materials by occupation											
Occupations	Organic dusts	Inks	Organic solvents	Alkaline compounds	Other gases	Lacquers and varnishes	Coal dust (bituminous)	Silicate dusts	Other metals	Carbon monoxide	Oils, fats, and waxes
Total number of workers in plants surveyed, 1,815											
Number of workers exposed.....	496	15	8	6	5	5	3	3	3	3	2
Percent of workers.....	37.7	1.1	0.6	0.5	0.4	0.4	0.2	0.2	0.2	0.2	0.1
Cutters	86	...	...	...	...	...	...	...	...	...	...
Dippers	5	...	2	2	2	2	...	...	...	...	...
Driers .....	...	...	3	3	3	3	...	...	...	...	...
Measurers .....	...	...	...	...	...	...	...	...	...	...	1
Operators	409	...	...	...	...	...	...	...	...	...	1
Seamstresses	21	...	...	...	...	...	...	...	...	...	...
Shippers .....	...	14	2	1	...	...	...	...	...	...	...
Turners	15	...	...	...	...	...	...	...	...	...	...
Utility men .....	...	1	1	...	...	...	...	...	...	...	...
Other	10	...	...	...	...	...	...	...	...	...	...
Maintenance .....	...	...	...	...	...	...	3	3	3	3	1

TABLE 41a—GLOVES—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Organic dusts	Organic solvents	Other gases	Lacquers and varnishes	Carbon monoxide
Number of workers exposed.....	469	8	5	5	3
General positive ventilation.....	53.7	...	...	...	...
General negative ventilation.....	9.0	75.0	100.0	100.0	...
Local exhaust .....	...	...	...	...	100

Materials for which no control measures were indicated are as follows: Inks (15), Alkaline compounds (6), Coal dust (bituminous) (3), Silicate dusts (3), Other metals (3), Oils, fats, and waxes (2) and Dermatitis producers (1).

TABLE 42—HATS AND CAPS—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Number of workers exposed to specified materials by occupation												
Occupations	Organic dusts	Carbon monoxide	Other gases	Silica dust	Petroleum products	Non-silicious dusts	Oils, fats, and waxes	Lacquers and varnishes	Mercury and its compounds	Inks	Organic solvents	Dermatitis producers
Total number of workers in plants surveyed, 292												Coal dust (bituminous)
Number of workers exposed	109	89	72	29	24	24	9	8	6	8	8	2
Percent of workers exposed	37.3	30.5	24.7	9.9	8.2	8.2	8.1	2.7	2.1	1.0	1.0	0.7
Blocker	5	21	21	...	...	...	...	6	6	...	...	...
Cutters	4	1	...	...	...	...	...	...	...	...	...	...
Engineers .....	...	1	...	...	...	...	...	...	...	...	...	1
Finishers	20	18	18	18	18	18	...	...	...	...	...	...
Inspectors	2	8	2	2	...	...	...	...	...	...	...	...
Operators	19	7	1	...	...	...	9	...	...	...	1	...
Pressers	4	6	6	...	...	...	...	...	...	...	...	...
Sewers	5	5	5	...	...	...	...	...	...	...	...	...
Shippers	4	2	1	3	...	...	...	...	...	3	...	...
Sizers .....	...	2	2	...	...	...	...	2	...	...	2	2
Supervisors	1	2	1	...	...	...	...	...	...	...	...	...
Trimmers	45	21	15	6	6	6	...	...	...	...	...	...

TABLE 42a—HATS AND CAPS—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Organic dusts	Carbon monoxide	Other gases	Silica dust	Non-silicious dusts	Lacquers and varnishes	Mercury and its compounds	Organic solvents	Coal dust (bituminous)
Number of workers exposed.....	109	89	72	29	24	8	6	8	1
General negative ventilation.....	48.6	89.8	86.1	82.8	100.0	100.0	100.0	83.3	100.0
Local exhaust	1.3	2.2	...	10.3	...	...	...	...	...

Materials for which no control measures were indicated are as follows: Petroleum products (24), Oils, fats and waxes (9), Inks (8), and Dermatitis producers (2).

TABLE 44—SUITS, COATS, AND OVERALLS—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																					
	Organic dusts	Carbon monoxide	Other gases	Other metals	Petroleum products	Dermatitis producers	Alkaline compounds	Inks	Non-silicious dusts	Coal dust (bituminous)	Lead and its compounds	Organic solvents	Mineral acids	Cyanides	Silicate dusts	Dyes	Silica dust	Halogenated hydrocarbons	Oils, fats, and waxes	Paints and enamels	Lacquers and varnishes	Alcohols, esters, and ethers
Total number of workers in plants surveyed, 6,797	646	86	74	39	26	23	16	14	12	11	9	8	8	5	4	4	3	3	3	3	2	1
Number of workers exposed.....	646	86	74	39	26	23	16	14	12	11	9	8	8	5	4	4	3	3	3	3	2	1
Percent of workers exposed.....	2.5	1.3	1.1	0.6	0.4	0.3	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Bus boys	4	..	..	..	2	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Cementers	6	..	6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Cleaners	16	..	..	..	..	..	..	..	..	..	..	5	..	..	..	1	..	8	..	..	..	..
Collar makers	8	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Cutters	456	4	8	..	2	2	..	8	..	..	4	..	..	..	..	..	..	..	..	..	..	..
Designers	9	..	..	..	2	2	..	8	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Hat makers	1	1	1	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Inspectors	7	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Jewelers	11	6	4	31	2	8	4	..	8	5	1	..	5	4	2	..	1	..	..	1	..	..
Laborers	12	4	1	1	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Marketers	47	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Pressers .....	..	55	46	..	..	..	..	8	..	..	2	2	..	..	..	..	..	..	..	..	..	..
Printers .....	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Sewers	47	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..
Shoppers	9	..	..	..	..	4	..	6	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Supervisors	6	5	3	4	..	2	1	1	..	2	..	..	1	1	..	..	..	..	..	..	..	..
Tailors	7	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Other	2	1	4	..	2	5	2	..	..	..	..	..	..	..	..	3	..	..	..	..	..	..
Maintenance	8	9	..	3	18	..	7	..	4	4	2	..	1	..	2	..	2	..	3	2	..	..

TABLE 43a—SHIRTS, COLLARS, AND CUFFS—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Organic dusts	Carbon monoxide	Dyes	Other gases
Number of workers exposed.....	89	5	4	1
General negative ventilation.....	16.9	.....	.....	.....
Local exhaust .....	....	100.0	100.0	100.0

Materials for which no control measures were indicated are as follows: Petroleum products (8), Coal dust (bituminous) (5), Inks (4), Salts (3), Dermatitis producers (2), Halogenated hydrocarbons (2), Alkaline compounds (1), Silica dust (1), Non-silicious dusts (1), Lead and its compounds (1), Organic solvents (1) and Paints and enamels (1).

TABLE 44a—SUITS, COATS, AND OVERALLS—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Organic dusts	Carbon monoxide	Other gases	Other metals	Non-silicious dusts	Mineral acids	Cyanides	Silicate dusts	Silica dust
Number of workers exposed.....	646	86	74	39	12	8	5	4	8
General negative ventilation.....	7.7	3.5	1.4	10.3	....	37.5	60.0	25.0	33.3
Local exhaust	1.2	34.9	14.9	20.5	66.7	....	....	....	....
Protective clothing .....	....	....	....	5.1	....	....	....	....	....

Materials for which no control measures were indicated are as follows: Petroleum products (26), Dermatitis producers (23), Alkaline compounds (16), Inks (14), Coal dust (bituminous) (11), Lead and its compounds (9), Organic solvents (8), Dyes (4), Halogenated hydrocarbons (3), Oils, fats and waxes (3), Paints and enamels (3), Lacquers and varnishes (2), and Alcohols, esters and ethers.

TABLE 45—WOMEN'S LIGHT CLOTHING—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation													
	Organic dusts	Petroleum products	Other gases	Carbon monoxide	Organic solvents	Other metals	Salts	Inks	Alkaline compounds	Silicate dusts	Lead and its compounds	Dyes	Paints and enamels	Dermatitis producers
Total number of workers in plants surveyed, 3,680														
Number of workers exposed..	716	61	42	37	12	5	5	5	5	5	3	3	2	1
Percent of workers exposed..	19.5	1.7	1.1	1.0	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0
Bundlers	10	...	...	...	...	...	...	2	...	...	...	...	...	...
Cleaners	7	...	5	...	12	...	5	...	5	...	...	...	...	...
Cutters	171	...	...	...	...	...	...	...	...	...	...	...	...	...
Designers	5	...	...	...	...	...	...	...	...	...	...	...	...	...
Dyers .....	...	...	...	...	...	...	...	...	...	...	...	3	...	...
Examiners	10	...	...	...	...	...	...	...	...	...	...	...	...	...
Knitters .....	...	8	...	...	...	...	...	...	...	...	...	...	...	...
Loopers	20	20	...	...	...	...	...	...	...	...	...	...	...	...
Markers	4	...	...	...	...	...	...	...	...	...	...	...	...	...
Operators	354	...	...	...	...	...	...	...	...	...	...	...	...	...
Pressers	33	...	37	37	...	...	...	...	...	...	...	...	...	...
Set up men	4	4	...	...	...	...	...	...	...	...	...	...	...	...
Sewers	37	10	...	...	...	...	...	...	...	...	...	...	...	...
Spinners	11	...	...	...	...	...	...	...	...	...	...	...	...	...
Spreaders	21	...	...	...	...	...	...	...	...	...	...	...	...	...
Stock keepers	6	...	...	...	...	...	...	1	...	...	...	...	...	1
Supervisors	14	5	...	...	...	...	...	...	...	...	...	...	...	...
Other	5	...	...	...	...	...	...	2	...	...	...	...	2	...
Maintenance	4	14	...	...	...	5	...	...	...	5	3	...	...	...

TABLE 45a—WOMEN'S LIGHT CLOTHING—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Organic dusts	Other gases	Carbon monoxide	Salts	Alkaline compounds	Dyes
Number of workers exposed.....	716	42	37	5	5	3
General negative ventilation.....	2.8	11.9	...	...	100.0	100.0
Local exhaust	0.1	23.8	21.0	...	...	...
Enclosure	0.8	11.9	...	100.0	100.0	100.0

Materials for which no control measures were indicated are as follows: Petroleum products (61), Organic solvents (12), Other metals (5), Inks (5), Silicate dusts (5), Lead and its compounds (3), Paints and enamels (2), and Dermatitis producers (1).

TABLE 46—*FUR GOODS—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation		
	Organic dusts	Halogenated hydrocarbons	Coal tar products
Total number of workers in plants surveyed, 188			
Number of workers exposed.....	123	6	1
Percent of workers exposed.....	65.4	3.2	0.5
Cleaners	6	6	1

The following occupations are exposed to organic dusts only: Clerks (5), Cutters (14), Designers (1), Finishers (23), Floor boys (2), Floor ladies (1), Fur matchers (2), Furriers (6), Glazers (2), Joiners (1), Liners (1), Managers (1), Mailers (4), Operators (15), Repairmen (10), Sewers (26), Squarers (1), Storers (1) and Tailors (1).

*The only control measures indicated are as follows: 1.6 percent local exhaust and 2.4 percent enclosure for organic dusts exposure, 33.3 percent local exhaust and 100 percent enclosures for halogenated hydrocarbons exposure.

TABLE 47—*OTHER CLOTHING—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation					
	Organic dusts	Petroleum products	Inks	Alcohols, esters, and ethers	Dermatitis producers	Organic solvents
Total number of workers in plants surveyed, 290						
Number of workers exposed.....	73	2	2	1	1	1
Percent of workers exposed.....	25.2	0.7	0.7	0.3	0.3	0.3
Cutter	9	...	...	...	...	...
Mechanics .....	...	2	...	...	...	...
Operators	54	...	...	...	...	...
Padders	8	...	...	1	...	...
Shipper	2	...	1	...	1	...
Other .....	...	...	1	...	...	1

*The only control measure indicated is 100 percent local exhaust for alcohols, esters, and ethers exposure.

FOODS

Table 48 shows the percentage of total exposures for each sub-group in the food industries. The principal exposures for this major group are dermatitis producers, organic dusts, other gases, and carbon monoxide.

TABLE 49 — BAKERIES — EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																		
	Dermatitis producers	Organic dusts	Carbon monoxide	Other gases	Alkaline compounds	Petroleum products	Oils, fats, and waxes	Coal dust (bituminous)	Aldehydes	Other metals	Salts	Mineral acids	Silicate dusts	Lead and its compounds	Lacquers and varnishes	Paints and enamels	Other chemicals	Non-silicious dusts	Organic solvents
Total number of workers in plants surveyed, 3,538	1,341	1,041	963	824	97	88	75	59	36	18	9	7	6	5	4	3	3	3	2
Number of workers exposed.....	37.9	29.4	27.2	23.6	2.7	2.5	2.1	1.7	1.0	0.5	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Percent of workers exposed.....	37.9	29.4	27.2	23.6	2.7	2.5	2.1	1.7	1.0	0.5	0.3	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Bakers	404	386	407	305	13	...	14	24	29	...	3	...	...	...	...	...	...	...	...
Bench men	112	97	29	24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cake makers	26	5	1	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Chefs	15	...	12	11	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...
Dividers	12	6	1	1	...	...	...	...	...	...	2	...	...	...	...	...	...	...	...
Ice men	46	...	13	9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Fillers	20	...	4	10	...	...	...	...	...	...	2	...	...	...	...	...	...	...	...
Greasers	2	2	2	9	14	1	1	10	...	...	...	...	...	...	...	...	...	...	...
Laborers	34	23	39	23	3	...	16	2	...	...	...	...	...	...	...	...	...	...	...
Make-up men	51	49	14	14	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...
Mixers	141	151	101	97	...	...	4	1	4	...	...	...	...	...	...	...	...	...	...
Molders	21	15	7	7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Operators	147	50	...	14	...	4	5	...	1	...	...	...	...	...	...	...	...	...	...
Oven men	66	56	164	189	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Packers	175	55	27	23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Peelers .....	...	5	5	5	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Salesmen	14	18	3	2	5	...	1	...	1	...	...	...	...	...	...	...	...	...	...
Scalers	6	...	2	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Sealers	20	33	...	...	...	...	14	...	...	...	...	...	...	...	...	...	...	...	...
Supervisors	12	16	24	20	...	2	1	...	...	1	...	...	...	...	...	1	...	...	...
Truck drivers	5	6	2	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Washers	6	6	20	29	63	12	6	1	...	...	...	4	...	...	...	...	...	...	...
Other	3	1	2	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Maintenance	3	52	68	22	5	03	3	27	...	17	...	3	6	5	4	3	3	3	1

TABLE 50.—DAIRY PRODUCTS—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																					
	Alkaline compounds	Dermatitis producers	Other gases	Petroleum products	Carbon monoxide	Salts	Oils, fats, and waxes	(Other chemicals	Coal dust (bituminous)	Organic solvents	Organic acids	Mineral acids	Non-silicious dusts	Organic dusts	Lead and its com- pounds	Silicate dusts	Other metals	Paints and enamels	Lacquers and varnishes	Alcohols, esters, and ethers	Mercury and its compounds	Infections
Total number of workers in plants surveyed, 1,725																						
Number of workers exposed.....	139	53	75	69	61	48	44	39	24	23	22	13	14	14	11	10	9	8	4	3	3	1
Percent of workers exposed.....	8.1	5.7	4.3	4.0	3.5	2.8	2.6	2.3	1.4	1.3	1.3	1.0	0.8	0.8	0.6	0.6	0.5	0.5	0.2	0.2	0.2	0.1
Bottlers	4	10	..	..	..	..	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Bench workers .....	..	15	..	..	..	..	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Butter makers	6	..	..	..	..	17	8	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Cheese makers .....	..	..	..	..	..	..	..	..	..	8	13	..	..	..	..	..	..	..	..	..	..	..
Clerks	4	..	..	4	..	..	1	5	..	..	..	..	..	3	..	..	..	..	..	..	..	..
Dairymen	23	6	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Ice cream makers	8	14	..	..	..	8	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Laborers	16	10	1	1	1	1	5	2	..	1	1	..	..	..	..	..	..	..	..	..	..	..
Milk handlers	14	..	3	3	..	..	..	1	2	2	..	..	..	..	..	2	..	..	..	..	..	..
Mixers .....	..	12	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Operators	1	9	..	..	..	1	5	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..
Pasteurizers	5	5	1	..	..	..	..	..	..	..	3	..	..	..	..	..	..	..	..	..	..	..
Supervisors	2	1	2	..	2	1	1	4	..	..	1	2	..	..	..	..	1	..	..	..	..	..
Technical men	4	..	12	3	3	12	2	..	4	..	3	9	..	..	..	..	..	..	3	..	3	..
Washers	54	..	16	..	1	..	2	23	..	2	..	..	..	..	..	..	..	..	..	..	..	..
Weighers	2	..	..	1	..	2	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..
Wrappers .....	..	8	2	..	..	..	8	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Other .....	..	6	5	5	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Maintenance	1	2	33	60	50	4	6	..	22	15	..	5	14	11	11	8	8	8	4	..	..	..

TABLE 49a—BAKERIES—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Organic dusts	Carbon monoxide	Other gases	Alkaline compounds	Petroleum products	Aldehydes	Other metals	Lacquers and varnishes
Number of workers exposed.....	1,041	963	834	97	88	36	18	4
General positive ventilation.....	1.1	1.5	0.8	....	....	....	....	....
General negative ventilation.....	25.4	26.3	31.5	....	4.5	2.8	....	....
Local exhaust	8.1	85.0	86.5	....	....	72.2	....	....
Enclosure	1.2	2.3	1.9	1.0	....	....	....	....
Gas mask .....	....	....	0.6	....	....	....	....	....
Respirator	0.1	....	....	....	....	....	....	50.0
Protective clothing .....	....	....	....	....	....	....	5.6	....

Materials for which no control measures were indicated are as follows: Dermatitis producers (1,341), Oils, fats and waxes (75), Coal dust (bituminous) (69), Salts (9), Mineral acids (7), Silicate dusts (6), Lead and its compounds (5), Paints and enamels (4), Other chemicals (3), Non-silicious dusts (3), Organic solvents (2), and Inks (1).

TABLE 50a—DAIRY PRODUCTS—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Alkaline compounds	Other gases	Petroleum products	Carbon monoxide	Salts	Oils, fats, and waxes	Other chemicals	Organic solvents	Organic acids	Mineral acids	Organic dusts	Other metals	Lacquers and varnishes	Alcohols, esters, and ethers	Mercury and its compounds
Number of workers exposed	189	75	69	61	48	44	39	23	22	18	14	9	4	8	3
General negative ventilation	...	5.3	...	27.9	...	...	...	78.3	...	...	...	11.1	75.0	...	...
Local exhaust.....	...	21.3	1.4	47.5	10.4	4.5	12.8	...	22.7	16.7	7.1	...	...	100.0	100.0
Enclosure	12.9	36.0	...	...	...	...	...	...	...	...	...	...	...	...	...
Gas Mask.....	...	6.7	...	...	...	...	...	...	...	...	...	...	...	...	...
Respirator .....	...	...	...	...	...	...	...	...	...	...	...	...	75.0	...	...
Protective clothing.....	2.2	...	...	...	4.2	...	...	...	...	...	11.1	...	...	...	...

Materials for which no control measures were indicated are as follows: Dermatitis producers (98), Coal dust (bituminous) (24), Non-silicious dusts (14), Lead and its compounds (11), Silicate dusts (10), Paints and enamels (8), and Infections (1).

Bakeries (Tables 49 and 49a)

Dermatitis producers which were indicated for individuals in contact with doughs, icings, and confectioners supplies, and organic dusts, are the principal exposures. Other gases and carbon monoxide are also important. The indicated control measures apply principally to gases of combustion, although general negative ventilation may control any material prevalent in the atmosphere of the bakeries.

Dairy Products (Tables 50 and 50a)

Only 8.1% of workers are exposed to alkaline compounds, the principal exposure. Controls consist chiefly of local exhausts and apply to minor exposures.

TABLE 51—CANDY—EXPOSURE BY OCCUPATION
TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation														
	Dermatitis producers	Carbon monoxide	Organic dusts	Other gases	Oils, fats, and waxes	Organic acids	Coal dust (bituminous)	Salts	Alcohols, esters, and ethers	Aldehydes	Inks	Petroleum products	Alkaline compounds	Non-silicious dusts	Other metals
Total number of workers in plants surveyed, 778															
Number of workers exposed	590	61	57	46	23	16	14	10	5	4	4	3	1	1	1
Percent of workers exposed.	68.0	7.8	7.3	5.9	3.0	2.1	1.8	1.3	0.6	0.5	0.5	0.4	0.1	0.1	0.1
Bottlers	..	..	..	..	4	4	..	..	4	..	..	..	..	..	..
Candy makers	79	32	9	24	1	..	8	..	..	..	..	..	1	..	..
Cleaners	..	..	6	..	1	..	..	..	..	..	..	..	..	..	..
Cookers	10	1	..	1	..	..	..	..	..	..	..	..	..	..	..
Decorators	12	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Dippers	90	1	..	1	2	..	..	..	..	..	..	..	..	..	..
Distributors	12	2	4	2	2	..	..	..	..	..	..	..	..	..	..
Fillers	10	..	..	..	2	..	..	..	..	..	..	..	..	..	..
Laborers	..	..	7	..	..	..	..	..	..	..	..	..	..	..	..
Mixers	24	..	2	..	..	2	..	5	..	..	..	..	..	..	..
Molders	8	..	7	..	..	..	..	..	..	..	..	..	..	..	..
Operators	21	..	4	..	..	..	..	..	..	..	..	..	..	..	..
Packers	218	5	3	6	3	6	..	3	..	..	2	2	..	..	..
Roasters	7	9	7	9	2	..	..	..	..	4	..	..	..	..	..
Rollers	5	3	..	2	..	..	..	..	..	..	..	..	..	..	..
Roughers	3	..	..	..	..	3	..	..	..	..	..	..	..	..	..
Supervisors	8	..	1	..	..	..	..	..	..	..	..	..	..	..	..
Table men	6	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Weighers	7	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Other	2	..	..	..	2	1	..	2	1	..	2	..	..	..	..
Maintenance	9	8	2	1	5	..	6	..	..	..	..	1	..	1	1

TABLE 51a—CANDY—PERCENTAGE OF EXPOSED WORKERS
PROVIDED WITH CONTROL MEASURES FOR
SPECIFIED MATERIALS

Control Measures	Dermatitis producers	Carbon monoxide	Organic dusts	Other gases	Aldehydes	Other metals
Number of workers	530	61	57	46	4	1
General negative ventilation	...	34.4	12.3	28.3	50.0	...
Local exhaust	...	78.7	40.4	71.7	...	...
Enclosure	...	4.5	...	15.2	...	...
Protective clothing	2.8	...	...	...	...	100.0

Materials for which no control measures were indicated are as follows: Oils, fats and waxes (23), Organic acids (16), Coal dust (bituminous) (14), Salts (10), Alcohols, Esters and ethers (5), Inks (4), Petroleum products (3), Alkaline compounds (1), and Non-silicious dusts (1).

Candy (Tables 51 and 51a)

Dermatitis producers is indicated as the principal exposure with the control measures, local exhaust, and general negative ventilation, applying principally to the minor exposures of carbon monoxide and other gases.

TABLE 52.—FLOUR AND GRAIN—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																		
	Organic dusts	Carbon monoxide	Petroleum products	Other gases	Oils, fats, and waxes	Coal dust	Lead and its com- pounds	Other metals	Mineral acids	Alkaline compounds	Organic solvents	Silicate dusts	Dermatitis producers	Paints and enamels	Salts	Other chemicals	Inks	Non-silicious dusts	Sulfur dioxide
Total number of workers in plants surveyed, 1,283																			
Number of workers exposed.....	772	85	65	49	48	38	29	28	15	13	12	11	10	7	7	5	5	3	1
Percent of workers exposed.....	60.2	6.6	5.1	3.8	3.7	3.0	2.3	2.2	1.2	1.0	0.9	0.9	0.8	0.5	0.5	0.4	0.4	0.2	0.1
Baggers	24	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Bag Handlers	9	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Cleaners	14	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Drivers	10	8	..	2	..	7	..	..	..	6	3	6	..	..	..	..	..	..	..
Driers	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Fillers	64	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Laborers	69	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Millers	206	7	..	3	35	..	..	..	..	..	..	..	..	..	3	3	..	8	1
Mixers	6	..	..	..	..	..	..	..	..	..	..	..	..	..	4	..	..	..	..
Operators	99	33	5	27	8	6	..	..	..	..	5	5	..	..	..	..	3	..	..
Printers .....	..	..	..	..	..	..	3	..	..	..	2	..	..	..	..	..	2	..	..
Scale girls	12	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Shippers	208	..	..	..	..	..	..	..	..	..	..	..	4	..	..	..	..	..	..
Supervisors	28	1	2	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Other	8	..	..	..	..	..	..	..	..	..	..	..	6	1	..	6	..	..	..
Maintenance	32	36	57	16	..	25	26	28	15	7	2	5	..	6	..	..	..	..	..

TABLE 52a — FLOUR AND GRAIN — PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Organic dusts	Carbon monoxide	Other gases	Oils, fats, and waxes	Lead and its compounds	Other metals	Silicate dusts	Other chemicals	Non-silicious dusts	Sulfur dioxide
Number of workers.....	772	85	49	48	29	28	11	6	8	1
General positive ventilation.....	0.3	...	...	...	...	...	...	...	...	...
General negative ventilation.....	29.4	18.8	32.7	...	44.8	82.0	...	...	...	...
Local exhaust	21.6	48.2	...	...	14.2	36.4	33.3	100.0	...	...
Enclosure	19.8	31.8	55.0	89.6	...	...	...	...	100.0	...
Wet method .....	...	...	...	...	3.6	9.1	...	...	...	...
Respirator	2.5	...	...	...	...	...	...	...	...	...
Protective clothing	0.3	...	...	...	28.6	...	...	...	...	...

Materials for which no control measures were indicated are as follows: Petroleum products (65), Coal dust (bituminous) (38), Mineral acids (15), Alkaline compounds (13), Organic solvents (12), Dermatitis producers (10), Paints and enamels (7), Salts (7) and Inks (5).

Flour and Grain (Tables 52 and 52a)

The predominant exposure is organic dusts which is controlled in part by negative ventilation, local exhaust, and enclosures.

Slaughter and Packing Houses (Tables 53 and 53a)

Dermatitis producers and infection hazards, the principal exposures, have no controls listed. Other gases, a relatively minor exposure related to refrigeration, is controlled by enclosures.

Ice Manufacture (Tables 54 and 54a)

Other gases with enclosure controls is the principal exposure in this group. The occupation, engineer, dominates all other occupations.

TABLE 53—SLAUGHTER AND PACKING HOUSES—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Dermatitis producers	Infections	Other gases	Salts	Carbon monoxide	Petroleum products	Oils, fats, and waxes	Coal dust (bituminous)	Alkaline compounds	Silica dust	Organic dusts	Other metals	Organic solvents	Organic acids
Total number of workers in plants surveyed, 1,669														
Number of workers exposed	1,024	668	167	153	148	65	50	41	25	10	9	7	7	2
Percent of workers exposed	61.4	40.0	10.0	9.2	8.9	3.9	3.0	2.5	1.5	0.6	0.5	0.4	0.4	0.1
Benchmen	28	31	...	...	3	...	...	...	...	...	3	...	...	...
Boners	53	36	10	...	...	...	...	...	...	...	...	...	...	...
Butchers	280	212	5	20	13	...	...	8	6	...	...	...	...	...
Casing men	56	47	...	43	...	...	...	...	...	...	...	...	...	...
Cooks	7	4	4	...	4	...	...	...	7	...	...	...	...	...
Cooler men	47	26	28	...	7	...	...	...	...	...	...	...	...	...
Curers	30	...	...	30	...	...	...	...	...	...	...	...	...	...
Cutters	104	89	6	4	...	22	...	...	5	3	...	3	...	...
Grinders	14	12	...	...	...	...	...	...	...	...	2	...	...	...
Laborers	12	14	...	1	...	...	...	...	...	4	...	4	...	...
Operators	10	7	...	...	...	...	...	...	...	...	...	...	...	...
Packers	60	1	...	8	...	...	...	...	...	...	...	...	...	...
Processors	20	9	...	15	...	...	...	...	...	...	...	...	...	2
Renderers	10	9	6	1	2	...	23	...	...	3	...	...	...	...
Sausage makers	150	83	54	7	54	...	...	...	2	...	...	...	...	...
Shippers	35	...	...	...	...	...	...	...	...	...	...	...	...	...
Skinners	7	7	...	...	...	...	...	...	...	...	...	...	...	...
Slaughterers	20	32	...	3	...	...	...	...	...	...	...	...	...	...
Smokers	19	3	21	14	19	...	...	...	...	...	2	...	...	...
Supervisors	16	18	...	...	...	...	1	...	...	...	...	...	...	...
Truck drivers	13	10	...	...	...	...	...	...	...	...	...	...	...	...
Warehousemen	38	14	...	...	...	...	...	...	...	...	2	...	...	...
Washers	2	1	...	...	1	...	...	...	1	...	...	...	...	...
Other	7	...	1	6	2	...	...	...	...	...	...	...	6	...
Maintenance	6	8	31	6	43	65	4	33	4	...	...	...	1	...

TABLE 53a—SLAUGHTER AND PACKING HOUSES—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Other gases	Salts	Carbon monoxide	Silica dust	Organic dusts	Other metals
Number of workers exposed	167	153	148	10	9	7
General positive ventilation	0.6	...	...	...	...	...
General negative ventilation	6.6	2.6	7.4	...	...	...
Local exhaust	15.0	...	4.6	...	...	...
Enclosure	47.8	...	2.0	...	77.8	...
Wet method .....	...	...	...	70.0	...	100.0
Gas mask	6.0	...	...	...	...	...
Respirator .....	...	...	...	...	22.2	...

Materials for which no control measures were indicated are as follows: Dermatitis producers (1,024), Infections (668), Petroleum products (65), Oils, fats and waxes (50), Coal dust (bituminous) (41), Alkaline compounds (25), Organic solvents (7) and Organic acids (2).

TABLE 54—ICE MANUFACTURE—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation													
	Other gases	Salts	Petroleum products	Coal dust (bituminous)	Carbon monoxide	Alkaline compounds	Silicate dusts	Organic solvents	Non-silicious dusts	Dermatitis producers	Silica dust	Lead and its compounds	Other metals	Mineral acids
Total number of workers in plants surveyed, 533														
Number of workers exposed	85	78	50	46	37	27	7	6	4	3	3	3	3	2
Percent of workers exposed	15.9	14.6	9.4	8.6	6.9	5.1	1.3	1.1	0.8	0.6	0.6	0.6	0.6	0.4
Bottlers						4								
Engineers	59	21	42	26	28	23		6						
Foremen							1				1			
Ice makers	5	15												
Ice pullers	14	30	2											
Laborers	3	6												
Mixers							5		4		1			
Operators	3	3				1				1				
Storage men		3								3				
Truck drivers				16										
Maintenance	1		6	4	9							3	3	2
														1

TABLE 54a—ICE MANUFACTURE—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Other gases	Salts	Carbon monoxide	Alkaline compounds	Silicate dusts	Organic solvents	Non-silicious dusts	Lead and its compounds	Paints and enamels
Number of workers exposed.....	85	78	37	27	7	6	4	3	1
Local exhaust .....	...	...	67.6	...	57.1	...	100.0	...	...
Enclosure	88.2	...	...	14.8	...	100.0	...	...	...
Gas mask	2.4	3.8	...	...	...	...	...	...	...
Respirator .....	...	...	...	...	...	...	...	33.3	100.0

Materials for which no control measures were indicated are as follows: Petroleum products (50), Coal dust (bituminous) (46), Dermatitis producers (3), Silica dust (3), Other metals (3), Mineral acids (2), and Lacquers and varnishes (1).

TABLE 55—LIQUOR, BEER, AND WINE—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																						
	Other gases	Alcohols, esters, and ethers	Dermatitis producers	Petroleum products	Organic dusts	Carbon monoxide	Alkaline compounds	Other metals	Coal dust (bituminous)	Mineral acids	Silicate dusts	Fluorides	Paints and enamels	Salts	Other chemicals	Non-silicious dusts	Lead and its compounds	Lacquers and varnishes	Oils, fats, and waxes	Organic solvents	Aldehydes		
Total number of workers in plants surveyed, 2,598																							
Number of workers exposed.....	361	344	259	207	148	133	130	70	58	55	53	30	27	24	17	15	14	8	6	5	3		
Percent of workers exposed.....	13.9	13.2	10.0	8.0	5.7	5.1	5.0	2.7	2.2	2.1	2.0	1.2	1.0	0.9	0.7	0.6	0.5	0.3	0.2	0.2	0.1		
Agers .....	..	..	5	..	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Bottlers	17	63	..	3	..	..	6	..	..	..	..	6	..	..	..	..	..	..	..	..	..
Brew masters	45	..	1	..	32	..	31	..	..	38	..	..	..	3	1	..	..	..	..	..	..
Cellar men	105	..	..	..	..	..	..	..	..	..	..	15	..	..	16	..	..	..	..	..	..
Chemists	12	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Compounds .....	..	3	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Cutters .....	..	29	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Fermenters	7	..	2	..	8	..	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Finishers	3	..	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Kettlemen	11	..	10	..	95	..	15	..	..	14	..	..	..	..	..	..	..	..	..	..	..
Labors	17	8	2	17	20	..	..	..	..	..	4	..	..	..	..	..	..	..	..	..	..
Loaders .....	..	..	1	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Millers	4	..	..	..	11	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Operators	21	194	157	24	18	..	9	..	..	..	..	..	..	7	..	..	..	..	..	..	..
Pitchers	1	..	..	3	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Storage men	6	17	1	4	6	..	3	..	..	3	..	..	..	..	..	..	1	..	1	..	3
Supervisors	37	11	..	40	..	26	..	37	1	..	39	..	11	..	..	..	..	..	..	..	..
Utility men	13	..	6	29	..	15	54	..	..	..	..	8	..	..	..	..	..	..	..	..	..
Washers	8	..	4	2	1	4	..	..	..	..	..	..	..	5	..	..	..	..	..	..	..
Other	65	..	4	87	14	91	7	33	57	..	10	..	16	9	..	15	13	8	6	..	2		
Maintenance .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..

TABLE 55a — LIQUOR, BEER, AND WINE — PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Other gases	Alcohols, esters, and ethers	Dermatitis pro- ducers	Petroleum products	Organic dusts	Carbon monoxide	Alkaline compounds	Other metals	Mineral acids	Silicate dusts	Fluorides	Paints and enamels	Non-silicious dusts	Lacquers and varnishes
Number of workers exposed	361	344	259	207	148	133	130	70	55	53	30	27	15	8
General negative ven- tilation	7.8	...	...	1.0	4.1	1.5	...	...	...	...	...	7.4	...	37.5
Local exhaust.....	5.8	...	...	2.5	31.8	51.9	...	10.0	...	...	...	...	46.7	...
Enclosure	12.7	1.7	...	...	11.5	...	11.5	...	...	...	...	...	...	...
Gas mask.....	2.2	...	...	...	...	...	...	...	...	...	...	...	...	...
Respirator .....	...	...	...	...	...	...	...	...	...	18.9	...	25.9	...	25.0
Protective clothing...	...	...	79.2	8.7	...	...	0.8	47.1	1.8	...	46.7	...	...	...

Materials for which no control measures were indicated are as follows: Coal dust (bituminous) (58), Salts (24), Other chemicals (17), Lead and its compounds (14), Oils, fats and waxes (6), Organic solvents (5) and Aldehydes (8).

Liquor, Beer, and Wine (Tables 55 and 55a)

Alcohols and dermatitis producers are indicated under the occupations, bottlers and operators. Other gases are important in the beer industry. Except for the high percentage of protective clothing for dermatitis producers, the control measures are scattered.

TABLE 56.—SOFT BEVERAGES—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																
	Alkaline compounds	Dermatitis producers	Carbon monoxide	Other gases	Petroleum products	Coal dust (bitu- mous)	Paints and enamels	Organic dusts	Organic acids	Other chemicals	Organic solvents	Non-silicious dusts	Lead and its com- pounds	Other metals	Mineral acids	Alcohols, esters and ethers	Salts
Total number of workers in plants surveyed, 743																	
Number of workers exposed.....	74	45	80	25	22	12	10	5	4	3	3	2	2	2	1	1	1
Percent of workers exposed.....	10.0	6.1	4.0	3.4	3.0	1.6	1.3	0.7	0.5	0.4	0.4	0.3	0.3	0.3	0.1	0.1	0.1
Bottlers	24	12	4	9	...	1	...	...	...	...	...	...	...	...	1	...	...
Labors	16	...	1	1	...	...	...	4	8	8	...	...	...	...	...	...	...
Mixers	2	24	1	1	...	...	...	...	...	...	...	...	...	...	...	1	...
Shippers	1	4	...	4	...	...	...	...	...	...	...	...	...	...	...	...	...
Soakers	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Supervisors .....	...	2	2	1	8	...	...	...	1	...	...	...	...	...	...	...	1
Washers	10	8	2	2	...	...	...	...	...	...	...	...	...	...	...	...	...
Maintenance	10	...	20	7	19	11	10	1	...	...	8	2	2	2	...	...	...

TABLE 56a—SOFT BEVERAGES—PERCENTAGE OF EXPOSED
WORKERS PROVIDED WITH CONTROL MEASURES
FOR SPECIFIED MATERIALS

Control Measures	Alkaline compounds	Carbon monoxide	Other gases	Paints and enamels
Number of workers exposed.....	74	30	25	10
General negative ventilation.....	...	10.0	...	...
Local exhaust .....	...	46.7	...	...
Enclosure	18.9	...	40.0	...
Respirator .....	...	...	...	10.0
Protective clothing.....	2.7	...	...	...
Other	1.4	...	...	...

Materials for which no control measures were indicated are as follows: Dermatitis producers (45), Petroleum products (22), Coal dust (bituminous) (12), Organic dusts (5), Organic acids (5), Other chemicals (3), Organic solvents (3), Non-silicious dusts (2), Lead and its compounds (2), Other metals (2), Mineral acids (1), Alcohols, esters and ethers (1), and Salts (1).

Soft Beverages (Tables 56 and 56a)

Alkaline compounds and dermatitis producers are the principal exposures. Control measures apply only to a small percentage of the workers.

Other Foods (Tables 57 and 57a)

This group includes many operations previously indicated in other food industries and has no special features not already discussed.

TABLE 57—OTHER FOODS—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																										
	Organic dusts	Oils, fats, and waxes	Dermatitis producers	Carbon monoxide	Other gases	Petroleum products	Alkaline compounds	Inks	Salts	Organic solvents	Coal dust (bituminous)	Alcohols, esters, and ethers	Other metals	Aldehydes	Silicate dusts	Dyes	Lead and its compounds	Organic acids	Other chemicals	Arsenic and its compounds	Sulfur	Mineral acids	Non-silicious dusts	Paints and enamels	Medicinals	Lacquers and varnishes	Sulfur dioxide
Total number of workers in plants surveyed, 1813	369	227	194	155	142	76	64	63	56	82	27	26	26	25	23	23	22	21	15	14	9	7	7	5	4	2	2
Percent of workers exposed...	20.4	12.5	10.7	8.5	7.8	4.2	3.5	3.5	3.1	1.8	1.5	1.4	1.4	1.4	1.3	1.3	1.2	1.2	0.8	0.5	0.5	0.4	0.4	0.3	0.2	0.1	0.1
Bakers	...	2	...	2	2	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...
Bottlers	...	3	...	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Candy makers	12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Chemists	...	7	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cookers	3	3	23	10	...	...	...	...	3	...	...	2	...	1	...	...	...	...	8	...	...	...	...	...	...	...	...
Compounders	...	...	7	...	...	...	...	2	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cutters	...	15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Feeders	8	1	4	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Fillers	10	21	10	2	...	...	1	...	...	...	2	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...
Grinders	11	2	1	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Inspectors	11	6	14	6	6	...	...	...	2	...	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...
Laborers	10	36	9	17	29	...	...	1	...	16	...	17	...	...	16	...	...	...	...	...	...	...	...	...	...	...	...
Loaders	12	18	12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mixers	28	11	18	6	14	...	...	...	11	...	1	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Operators	40	46	5	24	29	22	14	2	3	5	...	...	7	14	3	6	...	...	...	...	...	...	...	...	...	...	...
Packers	39	18	39	8	8	...	21	23	...	...	...	...	...	3	...	16	...	...	...	...	...	...	...	...	...	...	...
Printers	3	...	1	...	...	10	...	22	8	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...	...	...	...
Processors	...	1	8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Refiners	...	3	...	...	...	...	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Roasters	17	3	4	21	19	...	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...
Scalers	6	2	6	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Shippers	25	1	11	1	...	...	7	36	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Sorters	...	1	8	...	...	...	...	1	...	...	...	...	9	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Sprayers	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Supervisors	12	13	1	2	5	1	3	...	2	3	...	1	...	...	...	...	9	...	...	...	9	...	...	...	...	...	...
Washers	...	1	4	7	4	1	6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Other	2	6	1	2	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Maintenance	12	...	...	42	27	43	6	...	...	8	24	1	10	...	...	...	11	...	7	...	...	...	7	5	1	...	2

TABLE 57a—OTHER FOODS—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Materials for which no control measures were indicated are as follows: Dermatitis producers (194), Inks (63), Salts (56), Sulfur (9), Non-silicious dusts (7), Medicinals (4), Lacquers and varnishes (2), and Sulfur dioxide (2).																			
	Organic dusts	Oils, fats, and waxes	Carbon monoxide	Other gases	Petroleum products	Alkaline compounds	Organic solvents	Coal dust (bituminous)	Alcohols, esters, and ethers	Other metals	Aldehydes	Silicate dusts	Dyes	Lead and its compounds	Organic acids	Other chemicals	Arsenic and its compounds	Mineral acids	Paints and enamels	
Number of workers exposed.....	369	227	155	142	76	64	32	27	26	26	25	23	23	22	21	15	9	7	5	
General positive ventilation.....	1.4	...	11.0	20.4	...	...	15.6	48.1	...	26.9	...	26.1	...	...	...	73.3	...	...	20.0
General negative ventilation.....	10.8	0.4	11.0	19.7	1.8	34.4	18.8	...	...	26.9	90.0	26.1	95.7	...	...	...	...	...	...
Local exhaust.....	4.6	0.9	67.1	59.2	7.9	6.3	12.5	...	11.5	...	96.0	87.0	4.3	...	...	6.7	...	...	...
Enclosure.....	5.4	12.3	1.3	11.3	...	10.9	59.4	...	65.4	26.9	24.0	...	...	...	81.0	...	...	...	...
Wet method.....	0.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gas mask.....	...	...	...	0.7	...	...	9.3	...	...	...	...	...	...	...	...	...	...	...	...
Respirator.....	16.3	...	...	...	...	...	...	...	...	34.6	...	73.9	...	40.9	...	...	100.0	...	...
Protective clothing.....	...	15.4	...	...	...	21.9	6.3	...	...	73.1	...	...	...	40.9	...	73.8	100.0	85.7	...

Materials for which no control measures were indicated are as follows: Dermatitis producers (194), Inks (63), Salts (56), Sulfur (9), Non-silicious dusts (7), Medicinals (4), Lacquers and varnishes (2), and Sulfur dioxide (2).

IRON AND STEEL—(Table 58)

This major group includes agricultural implements, automobile factories, car and railroad shops, and ship and boat building, which are classified according to the product manufactured. Blast furnaces and rolling mills; foundries; welding, forging and heat treating; and machine shops are classified according to the method of manufacture. The manufacture of agricultural implements (Tables 59 and 59a) includes foundry operations, heat treating, machine shop work, and woodworking, as is indicated in the listing of occupations. Automobile factories (Tables 60 and 60a), the representatives of which are listed in the appendix, include a great variety of products. The occupations here are related to those of other iron and steel manufacturing, discussed later in detail. Car and railroad shops (Tables 62 and 62a) are engaged primarily in the manufacture of railway equipment. Ship and boat building (Tables 63 and 63a) includes woodworking, as well as iron and steel fabrication. There is nothing in the exposures or control measures in any of these groups, classified according to products manufactured, that cannot be more satisfactorily discussed under foundries, machine shops, etc.

TABLE 58—IRON AND STEEL—EXPOSURE TO SPECIFIED MATERIALS

Materials	Number and Percentage of Total Exposures to the Specified Materials in Each Industrial Subdivision																	
	Number of workers exposed to specified materials		Agricultural implements		Automobile factories		Blast furnaces and steel rolling mills		Car and railroad shops		Ships and boat building		Foundries		Welding, forging and heat treating		Machine shops	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Other metals	40,180		94	0.2	3,329	8.3	15,735	39.2	822	2.0	191	0.5	7,766	19.3	10,328	25.7	1,915	4.8
Carbon monoxide.....	23,513		85	0.4	715	3.0	12,517	53.2	406	1.7	84	0.4	3,459	14.7	5,860	24.9	387	1.6
Other gases	22,163		49	0.2	1,540	6.9	11,889	53.4	326	1.5	145	0.7	2,544	11.5	5,404	24.4	318	1.3
Petroleum products.....	21,575		89	0.4	2,810	13.0	5,742	26.6	409	1.9	133	0.6	2,405	11.1	7,971	36.9	2,016	9.3
Silicate dusts.....	16,363		124	0.8	1,872	8.4	9,132	19.1	91	0.6	5	0.0	8,128	49.7	3,028	18.5	483	3.0
Temperature change.....	13,158		39	0.3	1,772	1.3	9,009	68.5	116	0.9	....	....	1,618	12.3	2,204	16.8	....	....
Silica dust.....	11,665		143	1.2	293	2.5	2,312	19.8	182	1.6	43	0.4	7,920	67.9	617	5.3	155	1.3
Non-silicious dusts.....	8,663		50	0.6	525	6.1	2,212	25.6	393	4.5	55	0.6	1,898	21.9	2,292	26.5	1,228	14.2
Core gases	6,416		104	1.7	67	1.0	483	7.5	80	1.2	....	....	5,690	88.5	....	....	....	....
Coal dust (bituminous)...	3,590		24	0.7	106	3.0	1,842	51.3	100	2.8	....	....	985	26.0	494	13.8	89	2.5
Organic dusts	3,548		39	1.1	763	21.5	469	12.9	128	3.6	135	3.8	1,039	29.3	857	24.2	128	3.6
Lead and its compounds...	3,017		12	0.4	525	17.5	691	22.9	41	1.4	197	6.5	507	16.8	799	26.5	242	8.0
Alkaline compounds.....	2,754		....	....	113	4.1	1,418	51.5	26	0.9	....	....	329	11.6	567	20.6	310	11.3
Mineral acids	2,488		....	....	146	5.9	1,402	56.4	....	....	....	....	153	6.1	689	27.7	98	3.9
Paints and enamels.....	1,982		41	2.1	156	7.9	334	16.9	54	2.7	64	3.2	536	27.1	641	32.3	156	7.9
Oils, fats and waxes.....	1,584		10	0.6	133	8.4	150	9.5	12	0.8	....	....	1,008	63.6	120	7.6	151	9.5
Lacquers and varnishes...	1,125		13	1.2	211	18.8	104	9.2	45	4.0	....	....	296	26.3	398	35.4	58	5.2
Organic solvents.....	794		1	0.1	264	33.2	106	13.4	15	1.9	....	....	151	19.0	178	22.4	79	9.9
Other chemicals	692		....	....	4	0.6	552	79.8	....	....	....	....	90	13.0	46	6.6	....	....
Dermatitis producers.....	667		2	0.3	90	13.5	54	8.1	40	6.0	....	....	255	38.2	202	30.3	24	3.6
Manganese and its compounds.....	548		....	....	10	1.8	396	72.9	....	....	....	....	31	5.7	106	19.5	....	....
Salts	443		....	....	6	1.4	129	29.1	....	....	....	....	63	15.3	235	53.0	5	1.1
Coal tar products.....	332		....	....	....	....	272	81.9	....	....	....	....	1	0.3	6	1.8	53	16.0
Cyanides	318		....	....	19	6.0	....	....	5	1.6	....	....	76	23.9	192	60.4	26	8.2
Coal dust (anthracite).....	251		....	....	....	....	251	100.0	....	....	....	....	....	....	....	....	....	....
Inks	206		....	....	4	1.9	16	7.8	....	....	....	....	114	55.3	66	32.0	6	2.9
Asbestos dusts	192		....	....	....	....	73	38.0	....	....	....	....	5	2.6	100	55.2	8	4.2
Chromium and its compounds	175		....	....	....	....	44	25.1	19	10.9	....	....	18	10.3	69	39.4	25	14.3
Antimony and its compounds	155		....	....	....	....	....	....	18	11.6	....	....	137	88.4	....	....	....	....
Phosphorus and its compounds	154		....	....	....	....	154	100.0	....	....	....	....	....	....	....	....	....	....
Sulfur dioxide.....	147		....	....	....	....	139	94.6	....	....	....	....	....	....	....	....	....	....
Alcohols, esters and ethers.....	144		....	....	....	....	....	....	....	....	....	....	75	52.1	40	27.7	29	20.1
Cadmium and its compounds	102		....	....	5	4.9	....	....	....	....	....	....	5	4.9	74	72.5	18	17.6
Fluorides	75		....	....	....	....	....	....	....	....	....	....	50	66.7	25	33.3	....	....
Halogenated hydrocarbons.....	68		....	....	6	8.8	....	....	....	....	....	....	....	....	....	....	....	....
Benzol	62		....	....	....	....	55	88.7	....	....	....	....	....	....	....	....	....	....
Dyes	40		....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Sulfur	33		1	3.0	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Medicinals	7		....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Aldehydes	2		....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Aniline and its compounds	1		....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....

TABLE 59a — AGRICULTURAL IMPLEMENTS — PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Silica dust	Silicate dusts	Core gases	Other metals	Petroleum products	Carbon monoxide	Non-silicious dusts	Other gases	Paints and enamels	Temperature change	Organic dusts	Lacquers and varnishes	Lead and its compounds	Organic solvents
Number of workers exposed	143	124	106	94	89	85	50	49	41	39	39	18	12	1
General negative ventilation	4.9	...	...	...	...	...	...	...	17.1	...	...	53.8	...	100.0
Local exhaust.....	14.7	8.9	3.8	44.7	4.5	37.6	48.0	18.4	19.5	...	92.3	7.7	25.0	...
Respirator .....	...	...	...	9.6	...	...	18.0	...	2.4	...	...	7.7	...	...
Pressure helmet.....	0.7	0.8	...	1.1	...	...	...	...	...	...	...	...	...	...
Protective clothing....	...	...	...	17.0	...	...	18.0	...	2.4	10.3	...	38.5	...	...
Other .....	...	...	...	...	...	...	...	8.2	...	...	...	...	38.3	...

Materials for which no control measures were indicated are as follows: Coal dust (bituminous) (24), Oils, fats and waxes (10), Dermatitis producers (2) and Sulfur (1).

Blast Furnaces and Steel Rolling Mills (Tables 61 and 61a)

All companies having blast furnace or steel rolling mill operations were included in this classification regardless of any other operations in which they were engaged. Therefore, a great variety of occupations are listed in the blast furnace group which are also common to foundries and machine shops, since most of these companies also have foundries and machine shops in connection with blast furnaces and rolling mill operations. The principal exposures are other metals, carbon monoxide, other gases, and temperature change, which would be expected in an industry of this type. The 53 occupations listed in the table include all the important ones encountered in this industry. Every type of control measure is indicated in this group.

TABLE 60—AUTOMOBILE FACTORIES—EXPOSURE BY
OCCUPATION TO SPECIFIED MATERIALS

Number of workers exposed to specified materials by occupation								
Occupations	Other metals	Petroleum products	Other gases	Silicate dusts	Organic dusts	Carbon monoxide	Lead and its compounds	Non-silicious dusts
Total number of workers in plants surveyed, 12,809								
Number of workers exposed.....	3,329	2,310	1,540	1,372	763	715	523	525
Percent of workers exposed.....	26.0	21.9	12.0	10.7	6.0	5.6	4.1	4.1
Assemblers	171	...	...	4	20	...	60	61
Banders	30	...	...	30	...	...	80	...
Body builders	36	...	30	8	57	28	14	16
Carpenters .....	...	...	...	...	103	...	...	6
Cementers .....	...	...	...	301	...	...	...	...
Chippers	8	...	...	8	...	...	...	8
Core makers .....	...	...	8	...	8	18	...	...
Cupalo tenders	18	...	27	16	...	21	12	...
Dryers	24	...	24	24	...	24	24	...
Electricians	2	60	8	...	...	10	10	...
Engineers	62	61	...	50	...	8	...	...
Forgers	113	32	77	4	...	221	7	14
Grinders	705	70	15	468	...	...	119	217
Heat treaters .....	...	30	136	...	...	54	...	...
Inspectors	86	2	...	...	5	...	...	...
Laborers	12	12	2	12	38	8	...	6
Machinists	430	934	29	140	...	20	19	68
Molders .....	...	6	...	26	...	...	...	...
Operators	64	496	4	...	14	4	1	65
Painters	38	2	11	38	...	11	49	...
Pattern makers	78	...	...	...	94	...	75	4
Picklers	6	2	...	...	...	...	...	...
Platers	1	...	...	...	...	...	...	...
Polishers	93	1	...	...	8	...	...	53
Pressmen	6	747	...	...	...	5	...	...
Riveters	20	...	...	20	...	...	20	...
Sand blasters	11	...	...	...	...	...	...	...
Shippers	11	...	...	...	...	...	...	...
Solderers	2	23	4	...	52	4	...	2
Spark plug builders.....	24	...	24	...	...	24	24	...
Supervisors .....	...	...	...	72	...	...	...	...
Technical men	43	4	...	1	12	1	...	2
Upholsterers .....	...	1	...	...	...	2	...	...
Washers	3	1	3	23	224	3	...	...
Welders .....	...	12	11	...	...	12	...	...
Other	1,101	...	1,091	...	66	171	2	2
Maintenance	6	2	10	6	...	2	5	...
	131	312	26	121	62	64	87	3

TABLE 60—AUTOMOBILE FACTORIES—EXPOSURE BY
OCCUPATION TO SPECIFIED MATERIALS

Silica dust	Organic solvents	Lacquers and varnishes	Temperature change	Paints and enamels	Mineral acids	Oils, fats, and waxes	Alkaline compounds	Coal dust (bituminous)	Dermatitis producers	Core gases	Cyanides	Manganese and its compounds	Halogenated hydro- carbons	Salts	Cadmium and its compounds	Inks	Other chemicals
293	264	211	172	156	146	133	113	106	90	67	19	10	6	6	5	4	4
2.3	2.1	1.6	1.3	1.2	1.1	1.0	0.9	0.8	0.7	0.5	0.1	0.1	0.0	0.0	0.0	0.0	0.0
...
30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13	7	...	...	4	9	...	...	...	31	...	...	...	...	...	...	...	...
25	...	...	...	...	...	...	...	...	25	...	...	...	...	...	...	...	...
...
8	...	...	...	...	...	...	...	...	8	...	...	...	...	...	...	...	...
18	...	...	...	...	...	18	...	...	18	...	...	...	...	...	...	...	...
15	...	...	6	...	...	...	...	6	...	3	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	2	...	...	...	8	...	...	...	...	...	...	...	...	2	...	...	...
...	...	...	...	...	...	...	...	8	...	...	...	...	...	...	...	...	...
26	...	...	166	...	...	...	...	23	...	...	2	...	...	4	...	...	...
...
...	...	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...	...
17	4	2	...	...	12	...	18	2	1	12	...	...	2	...	...	...	...
9	...	10	...	...	...	...	...	...	...	...	10	...	...	...	...	...	...
26	...	...	...	...	...	...	...	...	26	...	...	...	...	...	...	...	...
...	...	...	...	...	4	...	...	...	...	...	...	...	...	...	...	...	...
61	45	105	...	145	...	23	...	...	...	...	...	...	...	...	...	...	...
3	...	87	...	...	...	...	...	...	12	...	...	...	...	...	...	...	...
...	...	...	...	...	46	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	11	...	10	...	...	...	6	...	...	...	5	...	...
...	3	...	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	90	...	...	...	...	...	...	...	...	...	...	...
...
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	2	...	2	...	...	...	1	...	2	...	...	4	...
...	...	...	...	...	24	...	...	...	...	...	...	...	...	...	...	...	...
...
...	1	...	...	...	1	...	...	1	...	...	...	...	...	...	...	...	4
...
...	171	...	...	...	...	...	...	...	20	...	...	...	...	...	...	...	...
...	2	...	...	2	...	...	49	...	...	...	...	10	...	...	...	...	...
...
...	...	4	...	1	...	...	...	...	1	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	29	3	...	4	27	...	25	66	...	...	...	...	1	...	...	...	...

TABLE 60a--AUTOMOBILE FACTORIES--PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH
CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures																							
Materials for which no control measures were indicated are as follows: Temperature change (172), Dermatitis producers (90), Salts (6) and Inks (4).																							
Other metals	Petroleum products	Other gases	Silicate dusts	Organic dusts	Carbon monoxide	Lead and its com- pounds	Non-silicious dusts	Silica dust	Organic solvents	Lacquers and varnishes	Paints and enamels	Mineral acids	Oils, fats, and waxes	Alkaline compounds	Coal dust (bituminous)	Core gases	Cyanides	Manganese and its compounds	Halogenated hydro- carbons	Cadmium and its compounds	Other chemicals		
Number of workers exposed....	3,329	2,810	1,540	1,372	763	715	598	595	293	264	211	156	146	133	113	106	67	19	10	6	5	4	
General positive ventilation....	...	...	...	...	...	...	...	...	7.6	...	12.8	...	15.0	...	...	...	...	...	...	...	...
General negative ventilation....	10.7	...	12.1	33.9	5.5	31.3	17.0	32.8	21.5	15.5	17.5	58.3	13.7	15.0	20.4	4.7	...	15.8	100.0	16.7	20.0	...	
Local exhaust	20.9	0.2	14.9	33.9	4.5	31.3	8.0	31.1	1.1	18.5	68.6	2.1	...	...	14.2	...	11.9	52.6	...	...	76.0
Enclosure	0.0	...	2.4	...	...	9.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Wet method	3.1	...	...	5.1	...	...	...	4.4	3.4	...	...	...	...	...	0.9	...	...	...	...	...	...
Respirator	9.2	0.2	...	3.1	...	...	4.5	41.9	7.8	...	41.7	62.2	2.7	...	...	...	...	...	...	...	...
Pressure helmet	0.3	...	...	...	...	...	...	...	3.7	...	...	...	...	...	...	...	...	...	...	...	...
Protective clothing	24.8	25.5	2.0	...	...	...	...	...	...	...	11.4	8.3	15.1	...	12.4	...	...	...	...	...	...

TABLE 61a—BLAST FURNACES AND STEEL ROLLING MILLS—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Control Measures																			
	Other metals	Carbon monoxide	Other gases	Temperature change	Petroleum products	Silicate dusts	Silica dust	Non-silicious dusts	Coal dust (bituminous)	Alkaline compounds	Mineral acids	Lead and its com- pounds	Other chemicals	Core gases	Organic dusts	Paints and enamels	Coal tar products	Salts	Benzol	Chromium and its compounds
Number of workers exposed.....	15,735	12,517	11,839	9,090	5,742	3,132	2,312	2,212	1,842	1,418	1,402	691	552	453	459	334	272	129	55	44
General positive ventilation.....	6.2	3.4	3.5	..	..	4.5	5.4	13.3	0.6	..	1.8	43.7	..	18.2	..	..	..	..	..	..
General negative ventilation.....	0.4	4.7	4.9	..	..	0.2	0.2	0.7	0.2	6.8	3.9	2.5	..	0.8	4.1	..	..	..	..	..
Local exhaust	5.1	9.7	6.4	..	..	..	2.8	3.2	0.2	8.0	29.7	11.7	24.6	15.9	7.2	0.6	5.5	..	27.3	6.8
Enclosure	0.6	1.4	2.2	..	..	..	0.8	..	..	2.3	17.7	6.1	18.7	15.9	..	0.8	66.9	15.5	86.4	..
Wet method	0.2	..	..	..	..	..	0.6	0.9	..	..	..	..	..	..	..	..	..	..	..	..
Gas mask .....	..	0.3	0.4	..	..	..	..	..	..	0.1	..	..	..	..	..	..	..	..	1.8	..
Respirator	0.7	..	..	..	..	..	0.5	1.9	3.4	0.2	..	4.6	..	..	..	16.2	..	4.7	..	..
Pressure helmet	0.2	0.1	0.1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Protective clothing	13.0	..	..	..	1.5	..	..	1.4	4.6	16.8	22.3	0.4	..	..	..	..	..	..	1.8	97.7
Other .....	..	..	..	16.1	..	..	..	..	..	..	0.5	..	..	..	..	..	..	..	..	..

Materials for which no control measures were indicated are as follows: Manganese and its compounds (386), Coal dust (anthracite) (251), Phosphorous and compounds (154), Oils, fats and waxes (150), Sulfur dioxide (139), Organic solvents (106), Lacquers and varnishes (104), Asbestos dusts (73), Dermatitis producers (54) and Inks (16).

TABLE 61—BLAST FURNACES AND STEEL ROLLING MILLS—
EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Number of workers exposed to specified materials by occupation											
Occupations	Other metals	Carbon monoxide	Other gases	Temperature change	Petroleum products	Silicate dusts	Silica dust	Non-silicious dusts	Coal dust (bituminous)	Alkaline compounds	Mineral acids
Total number of workers in plants surveyed, 33,088											Lead and its compounds
Number of workers exposed..	15,735	12,517	11,839	9,009	5,742	3,132	2,312	2,212	1,842	1,418	1,402
Percent of workers exposed...	47.6	37.8	35.8	27.2	17.4	9.5	7.0	6.7	5.6	4.3	2.1
Annealers	147	359	187	15	6	139	139	...	...	...	...
Bessemer men	100	196	100	319	...	102	...	...	100	...	...
Blockers	43	181	87	25	28	...	...	...	...	...	3
Boiler makers	121	106	108	...	12	...	...	78	1	...	...
Bottom makers .....	...	20	...	...	348	295	190	...	...	...	...
Brass men .....	...	23	77	...	8	8	...	...	...	...	...
Catchers .....	...	30	9	18	12	...	...	...	...	...	6
Chippers	246	...	...	...	92	92	...	...	...	16	26
Cleaners	56	5	3	8	13	69	54	...	...	...	...
Core makers	41	52	90	...	...	123	123	...	...	...	...
Crane men	408	392	349	196	110	47	33	13	35	36	27
Cupalo chargers .....	...	615	13	8	...	...	...	41	9	...	...
Doublers	268	261	85	269	...	...	...	...	...	...	...
Draw men	183	...	...	52	284	...	...	9	9	702	226
Feeders	66	70	66	66	...	...	...	...	6	...	51
Furnace tappers	5	167	...	...	...	67	67	150	...	...	...
Furnace tenders	369	134	433	560	40	125	206	216	28	...	...
Galvanizers	39	...	27	...	...	...	...	...	9	27	2
Gin men	70	40	40	40	...	...	...	40	40	...	...
Grinders	241	8	...	...	17	236	23	78	...	...	...
Heater men	1,166	1,065	1,444	1,587	47	6	6	...	25	...	...
Hot enders	95	89	88	87	...	...	...	...	...	...	...
Inspectors	580	155	154	1	10	5	5	...	...	...	...
Keepers	25	25	28	70	...	28	26	3	16	...	...
Laborers	3,387	1,888	2,907	2,003	461	777	551	126	332	75	89
Ladle men	61	61	121	85	...	12	12	50	...	...	...
Loaders	362	312	317	298	46	150	200	377	224	...	...
Machinists	1,072	358	441	...	1,115	217	...	451	17	9	283
Mill hands .....	...	370	110	275	...	...	...	...	...	...	...
Mixers	9	1	9	9	...	1	1	...	17	2	1
Molders .....	...	...	...	...	...	181	181	...	20	...	...
Open hearth men.....	...	...	...	...	...	...	...	...	...	...	...
Operators	2,485	2,069	1,959	1,791	1,337	64	21	108	299	124	118
Other steel workers.....	263	245	76	54	329	...	8	...	12	12	48
Picklers	3	...	...	...	...	...	...	...	...	231	359
Pressmen	25	...	...	...	9	9	...	4	4	...	...
Pump men	282	4	...	...	4	...	...	...	4	...	...
Reelers	89	63	...	3	79	...	...	...	...	...	2
Riggers	114	58	46	46	81	41	...	81	12	...	12
Rollers	657	681	711	715	142	23	...	...	...	7	...
Roughers	120	48	58	48	...	...	...	...	...	...	...
Rulers .....	...	...	...	84	24	...	...	...	...	...	...
Shake out men.....	...	...	...	...	...	23	23	...	...	...	...
Shear men	822	777	762	...	...	...	...	...	...	...	...
Shippers	193	95	58	27	63	...	...	12	...	5	92
Straighteners	282	128	134	...	10	...	...	...	...	...	...
Supervisors	69	120	69	42	91	7	5	19	43	...	8
Switchers	16	51	...	...	51	...	...	...	51	...	...
Technical men	36	11	11	...	51	...	...	8	...	8	191
Truck drivers	3	9	...	45	57	2	...	...	8	...	...
Winders	19	...	...	...	...	...	...	...	...	...	19
Other	146	100	185	74	51	40	59	31	113	89	60
Maintenance	988	1,145	1,077	144	1,172	190	144	127	408	75	84

TABLE 61—BLAST FURNACES AND STEEL ROLLING MILLS—
EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Number of workers exposed to specified materials by occupation																	
Other chemicals	Core gases	Organic dusts	Manganese and its compounds	Paints and enamels	Coal tar products	Coal dust (anthracite)	Phosphorus and its compounds	Oils, fats, and waxes	Sulfur dioxide	Salts	Organic solvents	Lacquers and varnishes	Asbestos dust	Benzol	Dermatitis producers	Chromium and compounds	Inks
552	483	450	396	334	272	251	154	150	139	129	106	104	73	55	54	44	16
1.7	1.5	1.4	1.2	1.0	0.8	0.8	0.5	0.5	0.4	0.4	0.3	0.3	0.2	0.2	0.2	0.1	0.0
..	..	..	100	..	25	..	..	..	100	4	..	..	..	..	..	..	..
..
..	..	..	15	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	8	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	12	..	..	..	..	..	..	..	..	..	..	6	..	..	..	..
..	123	..	..	..	..	..	..	102	..	..	..	51	..	..	..	..	..
..	22	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
..
..	..	95	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..
..	..	..	..	..	..	..	..	..	27	..	..	..	..	..	..	..	..
..
250	20	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..
..
..	86	130	72	6	37	42	..	..	..	18	2	..	..	39	..	..	..
50	..	..	..	..	..	..	50	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	60	..	..	..	..	..	..	..	..	..	..	16	..
..
..	..	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	170	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	209	..	..	..	209	104	..	..	..	..	..	..	..	..	..	..
3	12	13	..	46	114	..	..	..	39	15	12	..	..	8	..	4	..
..	..	..	..	..	..	..	..	12	..	..	12	..	..	..	..	..	..
..
..
..	..	..	155	..	..	..	..	..	..	..	45	..	..	..	..	..	..
..
..
..	..	..	..	..	..	..	..	..	..	..	..	3	..	..	..	..	..
..	23	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	3	..	..	..	..	..
..	..	..	1	1	..	..	..	..	..	1	..	..	..	..	3	..	15
..	2	2	..	..	3	..	..	..	..	..	..	..	..	2	..	..	..
..
249	..	..	45	..	..	..	..	..	..	..	6	..	..	..	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	15	..	..	..	..	..
..	12	44	..	11	26	..	..	..	37	..	12	..	..	3	23	24	1
..	..	160	..	70	9	..	..	36	..	27	28	20	67	3	28	..	..

TABLE 62a—CAR AND RAILROAD SHOPS—PERCENTAGE OF
EXPOSED WORKERS PROVIDED WITH CONTROL
MEASURES FOR SPECIFIED MATERIALS

Control Measures	Other metals	Carbon monoxide	Non-silicious dusts	Other gases	Silica dust	Organic dusts	Paints and enamels	Lacquers and varnishes	Lead and its compounds	Cyanides
Number of workers exposed.....	822	406	393	326	182	128	54	45	41	5
General negative ventilation.....	0.9	2.5	...	8.1	12.1	...	13.0	22.2	4.9	100
Local exhaust	22.2	29.6	44.5	5.2	...	46.9	...	...	...	100
Respirator .....	...	...	...	...	...	...	38.9	22.2	51.2	...
Pressure helmet.....	...	...	...	...	3.8	...	3.7	...	4.9	...
Protective clothing	29.1	...	...	...	...	...	8.7	...	4.9	...

Materials for which no control measures were indicated are as follows: Petroleum products (409), Temperature change (114), Coal dust (bituminous) (100), Silicate dusts (91), **Core gases** (80), Dermatitis producers (40), Alkaline compounds (26), Chromium and its compounds (19), Antimony and its compounds (18), Organic solvents (15) and Oils, fats and waxes (12).

TABLE 63—SHIP AND BOAT BUILDING—EXPOSURE BY
OCCUPATION TO SPECIFIED MATERIALS

Number of workers exposed to specified materials by occupation										
Occupations	Lead and its compounds	Other metals	Other gases	Organic dusts	Petroleum products	Carbon monoxide	Paint and enamel	Non-silicious dusts	Silica dust	Silicate dusts
Total number of workers in plants surveyed, 673.										
Number of workers exposed.....	197	191	145	135	133	84	64	55	43	5
Per cent of workers exposed.....	29.3	28.4	21.5	20.1	19.8	12.5	9.5	8.2	6.4	0.7
Electricians	61	61	61	...	14	...	...	...	...	...
Engineers	2	...	...	...	2	...	...	...	...	...
Insulators .....	...	...	...	...	...	...	...	5	...	5
Machinists .....	...	28	8	...	24	8	...	20	...	...
Painters	62	...	...	...	...	...	64	...	...	...
Pipefitters	56	...	...	...	68	...	...	...	...	...
Punch men.....	...	...	...	...	25	...	...	...	...	...
Riveters .....	...	20	...	...	...	...	...	...	...	...
Sand blasters .....	...	6	...	...	...	...	...	...	6	...
Tinners	16	16	16	...	...	...	16	...	...	...
Welders .....	...	60	60	...	...	60	...	...	...	...
Woodworkers .....	...	...	...	135	...	...	...	80	87	...

TABLE 63a—SHIP AND BOAT BUILDING—PERCENTAGE OF
EXPOSED WORKERS PROVIDED WITH CONTROL
MEASURES FOR SPECIFIED MATERIALS

Control Measures	Lead and its compounds	Other metals	Organic dusts	Paints and enamels	Non-silicious dusts	Silica dust
Number of workers exposed.....	197	191	135	64	55	43
Local exhaust	2.0	...	49.6	6.3	54.5	86.0
Respirator	2.0	...	...	6.3	...	...
Pressure helmet .....	...	3.1	...	...	...	14.0
Protective clothing .....	...	6.2	...	...	...	...

Materials for which no control measures were indicated are as follows: Other gases (146), Petroleum products (133), Carbon monoxide (84) and Silicate dusts (5).

TABLE 64—FOUNDRIES—EXPOSURE BY OCCUPATION
TO SPECIFIED MATERIALS

Number of workers exposed to specified materials by occupation													
Occupations	Silicate dusts	Silica dust	Other metals	Core gases	Carbon monoxide	Other gases	Petroleum products	Non-silicious dusts	Temperature change	Organic dusts	Oils, fats, and waxes	Coal dust (bituminous)	Paints and enamels
Total number of workers in plants surveyed, 21,806													
Number of workers exposed...	8,128	7,920	7,766	5,680	3,459	2,544	2,405	1,898	1,618	1,039	1,008	935	536
Per cent of workers exposed....	38.1	37.2	36.4	26.7	16.2	12.0	11.3	8.9	7.6	4.9	4.7	4.4	2.5
Assemblers	26	...	127	...	33	15	59	14	...	4	...	...	53
Chargers	62	66	86	27	101	18	...	32	86	...	...	79	...
Chippers	482	506	513	269	40	40	...	100	...	8	8	...	...
Cleaners	98	127	167	20	18	17	5	54	1	13	...	1	...
Coremakers	492	933	24	781	696	549	99	...	5	120	717	79	...
Cranemen	136	150	51	101	24	9	8	...	19	...	...	1	...
Cupola tenders..	122	125	230	96	224	127	15	43	234	10	2	140	...
Cutters .....	...	...	5	...	...	2	18	...	...	...	...	...	...
Drillers	2	2	40	...	...	...	45	30	...	...	...	...	...
Erectors	239	109	45	...	...	...	135	132	...	...	...	...	...
Forgers .....	...	...	88	...	109	66	85	23	...	...	...	7	...
Galvanizers .....	...	...	20	...	10	13	...	...	...	...	34	...	...
Grinders	455	219	981	56	...	...	81	320	...	90	...	...	...
Heat treaters...	2	2	41	1	90	84	39	...	11	25	...	28	...
Inspectors	28	49	11	22	12	8	16	1	...	2	26	...	...
Laborers	1,246	1,307	769	804	283	63	106	29	211	53	...	171	6
Machinists	273	81	1,094	19	122	118	1,033	763	2	...	53	8	4
Millwrights	10	16	14	4	13	8	85	6	...	...	...	...	...
Mixers	113	114	...	61	9	8	7	...	...	67	18	10	1
Molders	2,921	2,967	1,171	2,773	179	27	11	45	781	208	67	230	...
Operators	8	3	143	...	...	76	251	...	...	2	...	...	67
Oven tenders...	25	31	20	27	41	36	10	...	25	...	23	14	...
Painters	97	75	86	...	11	11	...	...	...	...	18	...	165
Pattern makers..	38	96	109	10	64	55	...	26	...	238	9	...	21
Picklers .....	...	...	...	...	...	...	...	...	...	...	...	...	...
Platers .....	...	...	38	...	...	...	...	1	...	...	...	...	...
Pourers	237	246	240	233	86	8	2	1	221	...	...	12	...
Receivers .....	...	1	1	1	2	...	...	...	1	...	...	1	...
Sand blasters...	73	132	143	4	...	...	...	...	...	2	...	...	...
Shake out men..	313	313	69	233	42	...	4	...	8	...	...	...	...
Sheet metal workers.....	325	...	231	...	201	205	...	28	...	...	24	...	...
Shippers	7	4	...	2	...	...	1	2	...	23	2	...	...
Sorters	25	18	17	8	...	...	...	...	...	...	...	...	...
Supervisors	103	114	33	57	13	10	3	23	1	5	2	1	1
Technical men..	3	5	7	1	2	2	7	...	2	3	...	...	...
Tool makers....	29	3	122	...	19	15	19	65	...	...	15	...	...
Welders	14	17	892	3	760	886	200	63	2	...	...	2	205
Other	41	49	44	4	43	12	12	19	2	33	4	14	11
Maintenance ...	88	90	84	13	202	56	199	14	...	88	1	142	2

TABLE 64—FOUNDRIES—EXPOSURE BY OCCUPATION
TO SPECIFIED MATERIALS

Number of workers exposed to specified materials by occupation																		
Lead and its com- pounds	Alkaline com- pounds	Lacquers and var- nishes	Dermatitis pro- ducers	Mineral acids	Organic solvents	Antimony and its compounds	Inks	Other chemicals	Cyanides	Alcohols, esters, and ethers	Salts	Fluorides	Manganese and its compounds	Chromium and its compounds	Cadmium and its compounds	Asbestos dust	Aldehydes	Coal tar products
507	320	296	255	153	151	137	114	90	76	75	68	50	31	18	5	5	2	1
2.4	1.5	1.4	1.2	0.7	0.7	0.6	0.5	0.4	0.4	0.4	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.0
...	...	...	...	...	14	...	...	...	...	...	...	...	...	...	...	...	...	...
...	57	...	...	26	25	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	19	72	...	20	...	...	...	...	...	...	...	...	...	...	...	...	...
6	...	...	...	3	...	...	...	...	...	...	...	...	...	...	1	...	...	...
67	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
40	22	...	...	5	...	...	...	...	...	...	5	...	...	...	...	...	...	1
34	...	...	...	...	...	...	...	...	43	34	...	23	...	...	...	...	...	...
7	65	6	11	...	8	26	...	1	8	5	12	...	1	...	...	...	...	...
...	1	4	...	...	6	...	...	...	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1	...	1	...	...	...	12	...	...	...	1	...	...	...	...	...	...	...	...
6	...	...	...	...	18	...	...	...	...	...	...	50	...	...	...	...	...	...
...	15	...	3	...	5	...	...	...	...	...	...	...	...	...	...	5	...	...
...	...	...	...	...	...	20	...	...	...	...	...	...	...	...	...	...	...	...
22	...	58	...	...	43	75	...	...	1	11	...	...	...	...	1	...	...	...
32	...	174	110	21	1	...	...	...	...	42	...	...	...	...	...	...	...	...
...	29	...	...	22	...	...	...	...	...	...	...	...	...	10	2	...	...	...
...	2	...	...	38	...	...	...	1	14	...	9	...	...	...	...	...	...	...
...	7	...	...	...	...	...	...	...	...	...	...	...	7	...	...	...	...	...
...
...
216	...	...	41	...	...	...	67	...	...	1	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	3	...	...	...	...	...	...	...	...	...
4	...	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2	...	...	2	7	...	...	46	88	2	...	2	...	...	8	...	...	...	...
...
...	...	...	...	...	...	3	...	...	...	...	...	...	...	...	...	...	...	...
5	8	7	14	...	...	4	1	...	...	...	...	...	...	...	...	...	2	...
57	114	24	...	30	8	...	...	...	5	15	6	...	...	...	1	...	...	...

TABLE 64a—FOUNDRIES—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Silicate dusts	Silica dust	Other metals	Core gases	Carbon monoxide	Other gases	Petroleum products	Non-silicious dusts	Temperature change	Organic dusts	Oils, fats, and waxes
Number of workers exposed	8,128	7,920	7,766	5,680	3,459	2,544	2,405	1,898	1,618	1,039	1,008
General positive ventilation	2.1	0.2	5.1	0.3	7.3	9.4	....	....	....	2.4	....
General negative ventilation	14.7	11.9	14.4	10.5	19.6	27.0	0.2	3.4	6.5	19.3	0.5
Local exhaust.....	9.7	3.5	16.2	7.7	36.6	30.1	1.0	22.0	....	16.4	....
Enclosure	1.7	3.5	4.0	0.2	4.9	6.4	0.3	0.4	....	1.4	....
Wet method	1.2	0.5	3.5	....	....	....	....	8.1	....	0.1	....
Respirator	1.6	1.8	1.7	....	....	....	0.0	2.7	....	1.1	....
Pressure helmet	1.0	1.5	1.5	....	....	....	....	....	....	0.2	....
Protective clothing	0.1	0.1	17.4	....	....	....	....	0.5	....	....	....
Other .....	....	0.0	0.0	....	0.1	0.1	....	....	....	....	....

Foundries (Tables 64 and 64a)

The foundry classification includes all sand molding and casting of iron and steel not otherwise classified regardless of the product manufactured. As would be expected, a high percentage of exposure is shown to silica and silicate dusts. Workers such as molders and shake-out-men working with molding sand were indicated as having both silica and silicate exposures. It is known that the percentage of silica in molding sand is high. However, the air-borne dust may show a great proportionate increase in the percentage of silicates due to the fact that this sand is bonded with finely divided clay. The exposure, core gases, also prevalent to a high degree, indicates decomposition products of core oil due to the action of molten metal on mold cores. Certain exposures have an origin in other types of metal fabrication, such as welding, forging, heat treating, and machine shop work carried on in connection with foundry operations. Although not apparent in the control measure table, it was observed in the original surveys that many of the specified controls were applied to operations such as metal grinding, sand blasting, and plating, rather than to the general dusts prevalent in the factory atmosphere. The percentage of silica dust controlled by pressure helmet is relatively small, but if the percentage of silica dust controlled by pressure helmet for sand blasting alone were computed, it would show a very general use of this control measure for sand blasting operations. The wet methods indicated here are related primarily to grinding operations.

TABLE 64a—FOUNDRIES—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Coal dust (bituminous)	Paints and enamels	Lead and its com- pounds	Alkaline compounds	Lacquers and varnishes	Dermatitis producers	Mineral acids	Organic solvents	Antimony and its compounds	Inks	Other chemicals	Cyanides	Alcohols, esters, Salts	Manganese and its compounds	Chromium and its compounds	Cadmium and its compounds	Aldehydes	
985	586	507	320	296	255	163	151	137	114	90	76	76	68	31	18	5	2
...	...	0.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9.5	0.4	14.6	5.3	12.5	...	6.5	21.2	...	...	2.2	68.4	1.3	7.4	...	11.1	20.0	...
1.3	4.3	8.1	23.4	12.8	...	17.0	13.2	54.7	...	20.0	50.0	18.7	19.1	9.7	65.6	40.0	50.0
1.5	...	...	...	...	...	5.2	...	...	...	...	21.1	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	1.1	...	...	...	...	...	...	...
...	2.2	0.2	...	1.0	...	...	4.0	...	...	...	2.6	...	...	...	...	...	...
0.3	12.5	...	...	4.7	0.8	15.7	...	...	13.2	6.7	21.1	...	7.4	...	88.9	...	...
...	...	...	...	...	...	...	...	...	...	...	8.9	...	...	...	...	...	...

Materials for which no control measures were indicated are as follows: Fluorides (50), Asbestos dusts (6), Medicinals (5), Coal tar products (1).

Welding, Forging, and Heat Treating (Tables 65 and 65a)

This group, composed of establishments where welding, forging, and heat treating operations are outstanding, includes all iron and steel industries not otherwise classified and regardless of the product in which heating the metal is an important part of the process. Some welding, forging, and heat treating operations were necessarily included in the foundry and blast furnace classifications. A decided change is noted in the characteristic exposures of this group as compared with that of foundries. Silica, to which 37% of the foundry workers were exposed, has dropped here to 1.7%. Silicates, to which 38% of the foundry workers were exposed, has dropped to 8.4%, which represents carborundum in metal grinding operations. Even the highest exposure, other metals, has dropped from 36.4% in the foundries to 28.7% in this group. Petroleum products, to which only 11.3% of the foundry workers were exposed, has increased here to 22.1%, indicating an increase in machine shop work. Carbon monoxide, other gases, non-silicious dusts, and temperature change occupy approximately the same relative importance. Other minor exposures are due to such operations as pickling, painting, and soldering. Local exhaust and general negative ventilation constitute important control measures. There is also a limited amount of wet grinding indicated. Respirators are used in grinding and painting operations, while protective clothing is applied to painting, pickling, and plating operations. It was pointed out in the general discussion of control measures that "other metals" exposures controlled by protective clothing indicated welding operations protected by welding helmets, goggles, etc. In this group 10.6% of such exposures are controlled by protective clothing.

TABLE 65—WELDING, FORGING, AND HEAT TREATING—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation										
	Other metals	Petroleum products	Carbon monoxide	Other gases	Silicate dusts	Non-silicious dusts	Temperature change	Organic dusts	Lead and its compounds	Mineral acids	Paints and enamels
Total number of workers in plants surveyed, 35,998											
Number of workers exposed	10,328	7,971	5,160	5,402	3,028	2,292	2,204	857	799	689	641
Percent of workers exposed	28.7	22.1	16.3	15.0	8.4	6.4	6.1	2.4	2.2	1.9	1.8
Apprentices	17	2	15	15	2	17	...	...	...	...	...
Assemblers	714	449	371	494	295	209	59	64	121	26	31
Casters	163	3	163	163	...	1	80	...	1	1	...
Chippers	147	...	...	...	3	3	...	...	...	...	...
Cleaners	75	16	22	23	53	11	...	22	11	8	5
Crane men	9	2	127	113	...	...	3	...	...	...	...
Cutters	43	35	87	83	3	1	...	10	...	...	...
Filers	32	17	...	...	1	...	...	...	...	...	...
Finishers	37	...	7	7	5	30	...	2	2	...	...
Forgers	421	70	531	195	2	1	212	2	3	...	...
Furnace tenders	467	450	848	626	28	38	677	34	34	...	2
Grinders	1,570	154	8	4	856	617	...	3	2	4	2
Heat treaters	79	247	408	374	7	...	65	31	62	3	...
Inspectors	70	33	40	58	61	...	1	3	5	4	2
Laborers	65	149	112	109	11	16	9	15	9	39	25
Loaders	10	...	...	...	...	...	27	...	...	...	10
Machinists	1,435	2,212	103	91	744	697	...	13	22	...	8
Mill workers	1,408	1	1,431	1,161	57	...	956	...	...	15	...
Millwrights	7	147	3	...	1	...	...	7	...	1	7
Operators	390	2,188	113	116	231	88	25	72	16	51	8
Painters	110	2	111	111	95	...	...	...	145	...	489
Pattern makers	4	...	2	2	...	9	...	90	7	...	...
Picklers	49	6	13	41	...	...	...	...	...	154	...
Pit men	1	...	1	...	...	...	20	...	...	...	...
Platers	249	...	162	144	...	6	...	...	2	227	...
Polishers	353	20	1	1	42	232	...	191	...	...	...
Pressmen	37	562	28	28	2	11	9	...	...	...	...
Riveters	12	...	21	7	...	...	...	...	...	...	...
Sand blasters	36	...	...	...	1	...	...	...	...	...	...
Sheet metal men	344	13	173	193	17	41	...	...	198	127	12
Shippers	6	64	6	...	...	...	...	75	6	...	1
Solderers	13	...	24	14	...	...	...	...	26	5	...
Stock men	6	14	1	1	8	2	12	...	...	...	...
Supervisors	46	22	32	29	7	11	6	1	8	5	1
Technical men	11	6	22	27	7	...	...	...	...	8	...
Tool and die makers	555	649	100	105	406	173	...	...	14	...	...
Trimmers	43	5	3	...	...	3	...	10	...	...	...
Welders	1,073	4	502	1,053	...	10	42	...	60	1	14
Winders	1	15	1	1	...	...	...	...	8	...	...
Wood workers .....	...	...	...	...	...	6	...	189	...	...	...
Other	15	9	17	15	1	6	2	7	1	...	4
Maintenance	206	405	306	43	82	54	...	16	36	10	20

TABLE 65—WELDING, FORGING, AND HEAT TREATING—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Number of workers exposed to specified materials by occupation																								
Silica dust	Alkaline compounds	Coal dust (bituminous)	Lacquers and varnishes	Salts	Dermatitis producers	Cyanides	Organic solvents	Oils, fats, and waxes	Manganese and its compounds	Asbestos dusts	Cadmium and its compounds	Chromium and its compounds	Inks	Halogenated hydrocarbons	Other chemicals	Alcohols, esters, and ethers	Sulfur	Dyes	Fluorides	Sulfur dioxide	Coal tar products	Aniline and its compounds	Benzol	
617	567	494	398	235	202	192	178	120	106	106	74	69	66	50	46	40	32	32	25	8	6	1	1	
1.7	1.6	1.4	1.1	0.7	0.6	0.5	0.5	0.3	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	
20	...	11	18	...	23	...	64	...	...	77	...	3	19	...	...	...	...	22	...	...	...	...	...
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23	80	...	1	1	2	...	17	...	30	...	...	...	...	11	...	...	...	...	...	...	...	...	...
...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1	15	3	...	...	...	...	...	...	...	3	...	...	...	...	...	...	...	...	...	...	...	...	...
...	
3	14	105	2	...	...	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	...	43	2	22	...	32	...	4	4	...	...	...	...	...	...	...	...	7	...	8	...	...	...
35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	22	51	...	11	...	34	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3	8	...	...	...	...	...	2	...	...	...	...	...	...	...	6	...	...	...	...	...	...	...	...
5	25	16	...	136	...	...	2	...	8	...	...	...	2	5	...	...	...	...	1	12	...	...	1
...	
32	3	25	...	...	...	...	...	38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	18	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	3	...	...	...	...	7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
24	206	...	2	...	...	41	25	29	47	3	7	10	...	...	3	7	25	...	...	...	3	...	...
97	27	...	281	...	...	1	26	...	...	...	...	6	...	25	4	...	...	8	...	...	...	...	...
7	...	...	37	...	30	6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	36	1	...	9	...	2	...	...	...	...	...	...	9	...	...	...	...	...	12	...	...	...	...
...	
3	66	...	...	49	...	69	...	...	...	36	28	...	...	...	...	...	...	...	...	...	...	...	...
81	33	...	...	...	...	...	30	8	...	29	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	2	...	...	...	...	12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	3	...	...	9	...	2	...	...	...	...	...	...	45	2	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12	...	...	3	...	...	...	...	...	...	...	...	3	...	...	...	...	...	...	...	...	...	...	...
4	8	7	2	1	1	3	...	1	3	...	2	2	1	...	...	...	...	...	1	...	...	...	...
2	...	...	...	...	2	...	...	...	...	...	...	6	...	...	39	...	...	...	...	...	...	...	...
...	...	...	...	...	...	7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
42	...	1	24	...	19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	5	...	3	...	...	...	...	...	...	15	...	...	...	...	...	...	...	...	...	...	...	...	...
96	...	...	...	...	94	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4	22	...	10	...	23	...	1	2	1	8	...	...	5	...	...	...	...	7	...	...	1	...	1
24	...	205	53	3	...	...	...	2	...	...	...	...	...	6	...	12	...	...	...	...	2	...	...

TABLE 65a — WELDING, FORGING AND HEAT TREATING — PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

[illegible]

Materials for which no control measures were indicated are as follows: Temperature change (2,204), Dermatitis producers (202), Inks (66), Alcohols, esters and ethers (40), Sulfur (32), Fluorides (26), Coal tar products (6), Benzol (1), and Aniline and its compounds (1).

TABLE 66—MACHINE SHOPS—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																											
	Petroleum products	Other metals	Non-silicious dusts	Silicate dusts	Carbon monoxide	Other gases	Alkaline compounds	Lead and its com- pounds	Paints and enamels	Silica dust	Oils, fats, and waxes	Organic dusts	Mineral acids	Coal dust (bituminous)	Organic solvents	Lacquers and varnishes	Coal tar products	Alcohols, esters, and ethers	Cyanides	(chromium and its compounds	Dermatitis producers	Cadmium and its compounds	Halogenated hydro- carbons	Dyes	Asbestos dusts	Inks	Benzol	Salts
Total number of workers in plants surveyed, 6,165	32,7	31.1	19.9	7.8	6.3	318	310	242	156	155	151	123	98	89	79	58	53	29	26	25	24	18	12	8	8	6	6	5
Number of workers exposed	32,7	31.1	19.9	7.8	6.3	318	310	242	156	155	151	123	98	89	79	58	53	29	26	25	24	18	12	8	8	6	6	5
Percent of workers exposed	32.7	31.1	19.9	7.8	6.3	31.8	31.0	24.2	15.6	15.5	15.1	12.3	9.8	8.9	7.9	5.8	0.9	0.5	0.4	0.4	0.4	0.3	0.2	0.1	0.1	0.1	0.1	0.1
Assemblers	69	175	151	14	55	64	1	69	18	57	20	12	12	..	6	..	..	..	..	..	..	..	..	..	..	..	..	..
Cleaners	4	1	1	..	2	2	15	..	..	5	4	..	..	..	12	..	..	..	..	..	..	..	..	..	..	..	..	..
Cutters .....	..	6	..	6	..	..	..	..	..	..	..	2	..	..	2	..	2	2	..	..	..	..	..	..	..	..	..	..
Extractors	7	..	..	..	..	4	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Finishers	40	5	2	3	2	7	..	..	..	..	..	..	..	..	..	8	..	..	..	..	..	..	..	..	..	..	..	..
Furnace men	6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Grinders	40	106	61	49	..	..	..	2	2	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Inspectors	5	..	..	..	5	1	..	..	..	..	..	1	..	..	6	..	..	..	..	..	..	..	..	..	..	..	..	..
Laborers	28	8	4	4	39	23	1	25	..	..	11	9	10	20	..	2	..	..	..	..	..	..	..	..	..	..	..	..
Machinists	1,295	1,115	759	339	115	74	243	48	56	..	67	16	..	28	6	..	22	..	7	2	..	..	..	..	6	..	..	..
Operators	222	13	4	..	9	13	2	..	..	6	..	4	2	2	..	27	45	15	15	..	2	..	..	..	6	..	6	..
Painters	1	21	..	..	..	..	..	20	43	2	15	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Picklers .....	..	6	..	..	..	8	17	..	..	8	..	..	10	..	..	..	..	..	..	14	13	..	18	2	..	..	..	..
Polishers	3	41	27	14	..	..	10	..	..	..	..	6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Repairmen	2	13	11	..	..	..	..	..	..	7	..	3	28	3	2	..	..	..	..	..	..	..	..	2	..	..	..	..
Sheet metal workers	10	95	84	12	46	42	8	35	5	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Supervisors	24	1	..	..	6	8	6	2	2	..	1	1	1	2	..	1	..	..	8	..	4	..	..	..	..	6	..	..
Tool and die makers	21	9	4	2	6	..	..	7	..	69	22	..	..	..	3	..	12	12	..	..	..	..	..	..	..	..	..	..
Upholsterers	136	201	156	37	85	42	..	..	..	..	..	12	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Wood workers .....	..	..	..	..	..	..	..	..	..	23	..	44	..	..	..	..	7	..	..	..	..	..	..	..	..	..	..	..
Other	18	5	3	8	9	2	9	1	..	..	..	5	2	..	..	..	2	..	..	8	..	..	..	..	..	..	..	..
Maintenance	26	35	4	..	54	28	..	7	8	..	2	2	..	33	..	..	..	..	2	..	..	..	..	..	..	..	..	..

Total number of
workers in plants
surveyed, 6,165

TABLE 66a—MACHINE SHOPS—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Number of workers exposed																							
	Petroleum products	Other metals	Non-silicious dusts	Silicate dusts	Carbon monoxide	Other gases	Alkaline compounds	Lead and its com- pounds	Paints and enamels	Silica dust	Oils, fats, and waxes	Organic dusts	Mineral acids	Organic solvents	Lacquers and varnishes	Coal tar products	Alcohols, esters, and ethers	Cyanides	Chromium and its compounds	Cadmium and its compounds	Halogenaed hydro- carbons	Benzol	Salts	
General positive ventilation	..	0.5	..	..	..	8.1	..	..	1.3	..	..	5.5	17.3	3.8	8.6	3.8	..	..	..	..	..	..	..	..
General negative ventilation	..	2.2	0.7	..	3.1	3.5	0.6	..	..	..	..	4.7	29.6	40.5	84.5	32.1	..	57.7	24.4	44.4	..	..	..	40.0
Local exhaust.....	..	33.1	37.4	20.3	40.3	29.2	7.9	23.0	21.3	13.9	..	5.5	47.7	40.5	84.5	32.1	51.7	34.6	64.0	55.6	58.3	100.0	40.0	..
Enclosure	0.3	0.1	..	..	2.3	0.9	..	..	..	..	..	..	..	..	..	..	..	..	..	..	16.7	..	..	..
Wet method .....	..	25.5	24.8	36.9	..	..	..	..	..	0.6	..	0.3	..	..	..	..	..	..	..	..	..	..	..	..
Gas mask .....	..	..	..	..	..	2.8	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Respirator .....	..	0.8	0.1	0.4	..	..	..	..	..	..	..	..	1.0	..	12.1	..	..	..	..	..	16.7	..	..	..
Pressure helmet .....	..	0.2	..	..	..	..	..	..	..	1.9	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Protective clothing.....	2.8	2.1	..	..	..	..	3.2	..	1.3	..	..	0.8	11.2	1.3	15.5	..	..	7.2	..	..	25.0	..	..	40.0

Materials for which no control measures were indicated are as follows: Coal dust (bituminous) (89), Dermatitis producers (24), Dyes (8), Asbestos dusts (8) and Inks (6).

Machine Shops (Tables 66 and 66a)

This classification is confined to the fabrication of iron and steel products where heat is not a primary factor in the manufacturing operations but which consists in the machining and grinding of metals with incidental plating, painting, and de-greasing operations. The average size of the plants in this group shows a considerable decrease over the foundries and heat treating groups. It is noted here that the percentage of individuals exposed to carbon monoxide and other gases has decreased to approximately one-third of that in the welding, forging, and heat treating group. This exposure is due principally to incidental soldering and similar operations and is listed under such occupations as assemblers and machinists. The percentage of exposure to petroleum products has correspondingly increased from 22% to 32%. It is noted that the number of specified occupations in the machine shop classification is substantially lower than that in foundries and heat treating groups. The control measures are concerned principally with grinding, painting, pickling, and plating operations. Emery, corundum, and aloxite, used as grinding abrasives, were classified as non-silicious dusts. Carborundum was classified under silicate dusts. It is doubtful, however, if a distinction between these materials has much significance.

METAL INDUSTRIES—(Except Iron and Steel)

Table 67 indicates the percentage of total exposures to the specified materials in each industrial sub-division of the metal industries. The sub-divisions of this group are considered separately because of the great diversity of activities.

TABLE 67 — METAL INDUSTRIES (EXCEPT IRON AND STEEL) — EXPOSURE TO SPECIFIED MATERIALS

Materials	Number of workers exposed to specified materials	Number and Percentage of Total Exposures to the Specified Materials in Each Industrial Subdivision															
		Brass factories				Clock and watch factories				Copper factories				Jewelry			
		No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Other metals	6,132	2,975	48.5	36	0.6	117	1.9	104	1.7	33	0.6	1,293	20.1	970	15.8	379	6.2
Silicate dusts	4,007	1,092	50.0	25	0.6	2	0.0	15	0.4	..	..	1,141	38.5	635	15.8	7	0.2
Silica dust	3,407	1,893	55.6	12	0.4	6	0.2	33	1.0	..	..	1,141	38.5	635	15.8	7	0.2
Carbon monoxide	2,697	1,290	47.8	11	0.4	114	4.3	80	3.1	26	1.0	193	16.8	560	21.6	96	1.4
Lead and its compounds	2,921	1,504	64.8	..	..	92	0.9	99	1.2	139	6.0	367	34.1	..	..	26	1.1
Other gases	2,921	1,073	46.8	13	0.6	104	4.5	89	3.5	26	1.1	289	12.6	546	23.8	33	1.1
Petroleum products	1,616	1,368	71.4	50	2.6	29	1.5	3	0.2	6	0.3	217	11.3	89	5.9	4	0.2
Other gases	1,616	1,368	71.4	50	2.6	29	1.5	3	0.2	6	0.3	217	11.3	89	5.9	4	0.2
Non-silicaceous dusts	1,658	1,794	47.9	12	0.7	..	..	..	..	..	..	199	12.0	837	31.5	218	13.1
Temperature change	372	376	48.1	..	..	2	0.2	..	..	..	..	311	24.2	267	30.6	8	0.9
Organic dusts	795	341	42.9	33	4.2	41	5.2	11	1.4	..	..	69	8.7	74	11.8	104	20.6
Oils, fats and waxes	462	484	73.1	..	..	23	3.6	..	..	..	..	82	6.3	76	11.5	37	5.6
Mineral acids	589	128	23.7	2	0.4	45	8.8	54	10.0	..	..	..	..	12	2.2	199	35.3
Fluorides	470	15	3.2	..	..	..	..	4	0.9	..	..	449	36.6	..	..	2	..
Alkaline compounds	444	101	22.7	4	0.9	..	..	16	3.6	..	..	171	38.5	10	2.3	123	27.7
Chromium and its compounds	401	79	19.7	2	0.5	..	..	..	..	..	..	69	17.2	..	..	..	..
Salts	331	16	4.8	..	..	..	..	..	..	..	..	308	38.1	..	..	..	..
Laquers and varnishes	321	118	36.8	6	1.6	..	..	1	0.3	..	..	96	39.9	79	24.6	..	..
Dermatitis producers	225	81	35.8	1	0.4	6	2.7	28	12.4	..	..	13	5.8	..	..	15	5.9
Cyanides	202	30	14.9	..	..	..	..	..	..	..	..	..	..	..	..	136	60.4
Cadmium and its compounds	213	49	23.0	2	0.9	10	4.7	..	..	..	..	64	30.0	63	29.6	2	0.9
Paints and enamels	198	122	61.8	..	..	12	6.1	..	..	..	..	18	9.1	10	5.1	9	4.5
Coal dust (bituminous)	150	23	15.3	..	..	..	..	..	..	..	..	3	2.0	105	70.0	13	8.7
Other chemicals	112	14	12.5	..	..	..	..	..	..	..	..	..	..	..	..	2	1.3
Manganese and its compounds	104	28	26.9	..	..	4	3.8	..	..	..	..	41	39.4	..	..	..	..
Organic solvents	72	28	38.9	2	2.8	..	..	2	2.8	..	..	..	..	13	12.5	2	1.9
Antimony and its compounds	72	15	20.8	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Phosphorus and Compounds	60	60	100.0	..	..	..	..	..	..	..	..	..	..	24	33.3	..	..
Organic acids	35	2	5.7	..	..	..	..	3	8.6	23	65.7	..	..	..	..	12	16.7
Hydrogen sulfide	30	..	..	..	..	9	37.5	..	..	..	..	30	100.0	..	..	7	20.0
Halogenated hydrocarbons	24	..	..	..	..	..	..	..	..	..	..	2	11.8	..	..	6	25.0
Benzol	17	15	100.0	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Asbestos dusts	16	15	100.0	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Sulfur	10	4	40.0	..	..	..	..	4	40.0	..	..	..	..	..	..	2	20.0
Alcohols, esters and ethers	5	1	20.0	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Coal tar products	4	..	..	..	..	4	100.0	..	..	..	..	..	..	..	..	..	..
Dyes	4	..	..	..	..	..	..	4	100.0	..	..	..	..	..	..	..	..
Mercury and its compounds	4	..	..	..	..	..	..	4	100.0	..	..	..	..	..	..	..	..

TABLE 68a — BRASS FACTORIES — PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Other metals	Silicate dusts	Silica dust	Lead and its compounds	Petroleum products	Core gases	Carbon monoxide	Other gases	Non-silicious dusts	Oils, fats, and waxes	Organic dusts	Dermatitis producers	Mineral acids	Coal dust (bituminous)	Lacquers and varnishes	Alkaline compounds	Chromium and its compounds	Phosphorus and compounds	Paints and enamels	Cyanides	Cadmium and its compounds	Organic solvents	Other chemicals	Antimony and its compounds	Fluorides	Manganese and its compounds
Number of workers exposed	2,975	2,002	1,893	1,504	1,368	1,256	1,220	1,073	794	484	341	142	128	122	118	101	79	69	49	31	30	28	23	15	15	14
General positive ventilation	0.2	0.2	0.3	...	...	...	0.2	0.2	0.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
General negative ventilation	...	...	...	...	...	...	11.9	12.5	2.5	...	3.2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Local exhaust	27.9	13.3	15.1	9.8	0.4	11.1	31.8	28.2	41.2	2.7	33.7	...	20.3	4.1	5.1	...	27.8	43.3	16.3	9.7	90.0	...	4.3	...	...	...
Enclosure	1.00	0.6	1.4	0.1	...	1.0	2.5	3.5	...	...	0.6	...	...	...	1.7	...	81.0	1.7	12.2	77.4	26.7	7.1	65.2	20.0	100.0	7.1
Wet method	3.2	1.0	0.4	0.3	...	...	...	...	2.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Respirator	1.3	1.0	1.4	1.2	...	...	...	...	0.2	...	...	...	...	4.1	0.8	...	...	...	2.0	...	...	3.5	...	...	...	...
Pressure helmet	0.6	0.4	1.0	0.4	...	...	...	...	...	...	...	4.2	43.0	...	3.4	...	...	...	16.3	29.0	10.0	...	...	...	13.3	...
Protective clothing	4.2	...	...	13.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Other	...	...	...	0.1	...	...	0.1	0.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Materials for which no control measures were indicated are as follows: Temperature change (376), Inks (28), Salts (16), Asbestos dusts (15), Sulfur (4), Organic acids (2) and Alcohols, esters and ethers (1).

TABLE 68—BRASS FACTORIES—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation										
	Other metals	Silicate dusts	Silica dust	Lead and its compounds	Petroleum products	Core gases	Carbon monoxide	Other gases	Non-silicious dusts	Oils, fats, and waxes	Temperature change
Total number of workers in plants surveyed 7,232											
Number of workers exposed	2,975	2,002	1,893	1,504	1,868	1,256	1,220	1,073	794	484	376
Percent of workers exposed	41.1	27.7	26.2	20.8	18.9	17.4	16.9	14.8	11.0	6.7	5.2
Assemblers	162	140	...	42	118	...	56	52	11	9	...
Cleaners	70	76	73	13	...	60	15	15	11	12	...
Core makers	31	261	321	6	...	298	232	198	14	249	...
Cupola tenders	162	61	63	73	9	40	156	102	...	...	89
Grinders	305	173	105	166	...	31	11	17	132	12	...
Inspectors	6	5	14	212	10	2	10	11	2	1	...
Laborers	173	146	189	89	5	113	81	66	2	28	78
Machinists	564	143	1	116	526	...	89	86	184	85	...
Mixers	44	49	40	6	...	45	2	2	1	2	...
Molders	552	707	708	297	15	568	185	157	49	26	167
Operators	63	18	1	289	501	...	16	16	1	24	1
Oven tenders .....	...	8	9	...	...	11	15	15	...	9	...
Painters .....	...	1	...	...	...	...	...	...	...	...	...
Pattern makers	182	4	34	19	...	...	148	144	155	...	72
Platers	64	...	...	3	2	...	14	14	...	...	...
Polishers	279	20	181	42	3	...	...	...	193	...	99
Pourers	30	25	25	17	3	13	6	6	...	...	29
Sand blasters	27	16	23	6	...	6	2	3	...	...	...
Shake out men	21	49	49	16	...	44	3	3	1	...	...
Shippers	9	...	...	2	8	...	...	...	3	6	40
Sheet metal workers ...	19	8	8	11	...	2	4	5	2	...	...
Supervisors	78	37	36	23	20	20	51	49	23	13	2
Technical men .....	...	...	...	...	...	...	...	...	...	2	...
Welders	52	...	...	5	...	...	50	52	...	...	...
Other	41	12	15	22	12	3	41	41	9	5	8
Maintenance	36	38	43	29	135	...	33	19	1	1	16

Brass Factories (Tables 68 and 68a)

This group includes brass and bronze casting and machining. The operations are similar to those encountered in iron foundries and machine shops but differ in the type of materials used. The principal exposures are other metals, which include copper, tin, and zinc; and silica and silicate dusts used in molding, sandblasting, grinding, and polishing. Lead, to which 20.8% of the workers in this group are exposed, originates primarily from the lead used in bronze castings. Local exhaust, which applies to crucible furnaces, grinding operations, buffing, plating, etc., is the dominant control measure. General negative ventilation for foundry atmospheres and protective clothing for plating and painting operations are also important.

TABLE 68—BRASS FACTORIES—EXPOSURE BY OCCUPATION
TO SPECIFIED MATERIALS

Number of workers exposed to specified materials by occupation																				
Dermatitis producers	Mineral acids	Coal dust (bituminous)	Lacquers and varnishes	Alkaline compounds	Chromium and its compounds	Phosphorus and compounds	Paints and enamels	Cyanides	Cadmium and its compounds	Organic solvents	Inks	Other chemicals	Salts	Antimony and its compounds	Asbestos dusts	Fluorides	Manganese and its compounds	Sulfur	Organic acids	Alcohols, esters, and ethers
142	128	122	118	101	79	60	49	31	30	28	26	23	16	15	15	15	14	4	2	1
2.0	1.8	1.7	1.6	1.4	1.1	0.8	0.7	0.4	0.4	0.4	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.0	0.0
9	10	...	32	31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	3	7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16	...	11	12	...	...	...	...	...	...	9	...	...	...	...	...	...	...	...	...	...
...	...	4	...	...	...	11	...	...	...	...	...	...	...	...	...	...	1	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...
1	...	...	1	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...
21	...	76	8	...	...	5	28	...	...	...	...	...	...	1	...	...	1	...	...	...
...	...	...	...	...	...	...	3	1	...	...	...	...	...	...	...	...	...	2	...	...
...
...	...	3	...	...	...	35	...	...	...	...	...	...	...	2	9	...	9	...	...	...
1	9	6	...	36	...	...	2	...	...	...	...	...	...	...	...	...	...	2	...	...
1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	8	...	...	...	9	...	...	3	...	...	...	...	...	...	...	...	...	1
30	...	...	41	...	...	...	...	...	...	15	...	...	...	...	...	15	...	...	...	...
...	94	...	...	25	67	...	...	29	24	...	...	...	...	5	...	...	14	...	2	...
50	...	...	...	...	10	...	...	...	6	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	1	...	...	1	...	...
...
...	...	...	...	...	...	...	3	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	1	...	...	...	...	...	5	...	...	1	...	...	1	...	...
...	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1	4	...	5	2	1	4	2	1	...	...	...	1	...	...	1	...	1	...	...	...
4	2	...	...	...	1	...	...	...	...	...	...	22	18	...	...	...	...	...	...	...
...
4	1	...	1	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...
3	4	22	6	...	...	...	4	...	...	1	...	5	9	...	...	...	...	...	...	...

Clock and Watch Factories (Tables 69 and 69a)

Woodworking, metal stamping, and machining are the principal operations in this group. The percentage of exposures to all materials are low in comparison with those of other groups. Local exhaust in sawing, metal grinding, and buffing; and wet grinding methods are the dominant control measures listed.

TABLE 69 — CLOCK AND WATCH FACTORIES — EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Number of workers exposed to specified materials by occupation																	
Occupations	Petroleum products	Other metals	Organic dusts	Silicate dusts	Dermatitis producers	Benzol	Other gases	Silica dust	Non-silicious dusts	Carbon monoxide	Lacquers and varnishes	Alkaline compounds	Chromium and its compounds	Inks	Mineral acids	Paints and enamels	Cyanides
Total number of workers in plants surveyed, 372																	
Number of workers exposed..	50	36	33	25	18	15	13	12	12	11	5	4	2	2	2	2	1
Percent of workers exposed..	13.4	9.7	8.9	6.7	4.8	4.0	3.5	3.2	3.2	3.0	1.3	1.1	0.5	0.5	0.5	0.5	0.3
Buffers .....	..	22	9	22	..	..	..	9	5	..	2	..	..	..	..	..	..
Cleaners .....	..	2	..	2	..	..	2	2	..	..	..	2	..	..	..	..	..
Cutters	2	..	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..
Machinists	6	6	..	..	..	..	6	..	6	6	..	..	..	..	..	..	..
Operators	9	..	..	..	..	..	..	..	1	..	3	..	..	..	..	..	..
Painters .....	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	2	..
Platers .....	..	3	1	..	..	..	..	..	..	..	..	2	2	..	2	..	1
Pressmen	16	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Repairmen	15	..	..	..	..	15	..	..	..	..	..	..	..	..	..	..	..
Wood workers .....	..	..	22	..	18	..	..	..	..	..	..	..	..	..	..	..	..
Other	2	3	1	1	..	..	3	1	..	3	..	..	..	..	..	..	..

TABLE 69a — CLOCK AND WATCH FACTORIES — PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Other metals	Organic dusts	Silicate dusts	Other gases	Silica dust	Non-silicious dusts	Carbon monoxide	Lacquers and varnishes	Alkaline compounds	Chromium and its compounds	Mineral acids	Cyanides
Number of workers exposed	36	33	25	13	12	12	11	5	4	2	2	1
General negative ventilation	25.0	3.0	4.0	7.7	8.3	41.7	9.1	...	...	100	100	...
Local exhaust	38.9	69.7	32.0	23.1	100	41.7	9.1	60.0	50.0	100	50.0	100
Enclosure .....	...	...	4.0	...	8.3	...	...	...	...	...	...	...
Wet method	50.0	...	48.0	...	...	50.0	...	...	...	...	...	...
Respirator .....	...	...	...	...	...	...	60.0	...	...	...	...	...
Protective clothing	5.6	...	...	...	...	...	...	50.0	100	50.0	...	...

Materials for which no control measures were indicated are as follows: Petroleum products (50), Dermatitis producers (18), Benzol (15), Inks (2) and Paints and enamels (2).

TABLE 70 — COPPER FACTORIES — EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																		
	Other metals	Carbon monoxide	Other gases	Mineral acids	Organic dusts	Petroleum products	Oils, fats, and waxes	Lead and its compounds	Coal dust (bituminous)	Paints and enamels	Halogenated hydrocarbons	Non-silicious dusts	Silica dust	Cyanides	Alkaline compounds	Coal tar products	(Organic solvents	Temperature change	Silicate dusts
Total number of workers in plants surveyed, 468																			
Number of workers exposed....	117	114	104	45	41	29	23	22	12	10	9	7	6	6	6	4	4	2	2
Percent of workers exposed....	25.1	24.5	22.3	9.7	8.8	6.2	4.9	4.7	2.6	2.1	1.9	1.5	1.3	1.3	1.3	0.9	0.9	0.4	0.4
Annalers	18	18	14	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Assemblers	4	4	4	..	..	..	..	6	..	..	..	..	..	..	..	..	..	..	..
Copper smiths	8	2	..	6	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..
Furnace tenders .....	..	17	11	..	..	..	..	..	..	..	9	6	..	..	..	..	2	2	..
Machinists	6	..	7	..	..	7	..	..	..	..	..	..	..	..	..	..	..	..	..
Metal workers	2	14	14	14	..	..	..	16	..	10	..	..	..	..	..	..	..	..	..
Operators	2	9	2	19	38	..	23	..	..	..	..	..	..	..	..	..	..	..	..
Pickers .....	..	..	..	6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Polishers	8	2	..	..	..	2	..	..	2	..	..	..	6	6	6	2	2	..	..
Rollers	40	40	40	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Tinners	10	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Welders	18	8	8	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Other	2	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Maintenance	1	..	..	..	1	20	..	..	10	..	..	1	..	..	..	..	..	..	2

Total number of workers in
plants surveyed, 466

TABLE 71—JEWELRY—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																			
	Other metals	Carbon monoxide	Other gases	Mineral acids	Non-silicious dusts	Silica dust	Lead and its compounds	Cyanides	Alkaline compounds	Silicate dusts	Organic dusts	Fluorides	Dyes	Mercury and its compounds	Sulfur	Petroleum products	Organic acids	Inks	Laquers and varnishes	
Total number of workers in plants surveyed, 315																				
Number of workers exposed....	104	80	80	54	35	33	29	28	16	15	11	4	4	4	4	1	3	2	1	
Percent of workers exposed ...	33.0	25.4	25.4	17.1	11.1	10.5	9.2	8.9	9.1	4.8	3.5	1.3	1.3	1.3	1.3	1.0	1.0	0.6	0.3	
Benchmen	8	6	4	7	8	8	..	4	4	4	4	4	..	..	4	..	3	..	..
Casters	3	2	3	..	..	2	..	..	..	1	..	..	..	..	..	..	..	..	..
Diamond cutters	1	1	1	..	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Dyers .....	..	..	..	..	..	..	1	..	..	2	..	..	4	..	..	..	..	..	..
Enamellers	1	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Engravers .....	..	..	..	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Jewelers	68	61	63	37	10	8	25	14	10	1	..	..	..	..	..	1	..	..	..
Manufacturers .....	..	..	..	4	..	..	..	4	..	2	..	..	..	4	..	..	..	..	..
Messengers	2	2	2	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Polishers	12	2	2	2	8	10	2	6	2	1	7	..	..	..	..	..	..	2	..
Stampers .....	..	..	..	..	..	2	2	..	..	2	..	..	..	..	..	..	..	..	..
Stone setters	2	1	1	1	..	..	1	..	..	1	..	..	..	..	..	..	..	..	..
Superintendents	2	1	1	1	2	1	..	..	..	1	..	..	..	..	..	..	..	..	..
Tool and die makers	2	2	2	2	2	..	..	..	..	..	..	..	..	..	..	2	..	..	..
Watch makers	2	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..
Other	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1

Total number of workers in plants surveyed, 315

Copper Factories (Tables 70 and 70a)

The principal exposures are other metals, carbon monoxide, and other gases, which are well distributed among the listed occupations. Local exhaust is the only significant control measure.

TABLE 70a—COPPER FACTORIES—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Other metals	Carbon monoxide	Other gases	Organic dusts	Petroleum products	Paints and enamels	Non-silicious dusts	Coal tar products	Organic solvents	Silicate dusts
Number of workers exposed	117	114	104	41	29	10	7	4	4	2
General negative ventilation.....	8.4	1.8	...	2.5	...	...	100	100	100	...
Local exhaust	6.0	16.7	6.7	2.5	6.9	...	100	...	...	100
Protective clothing	12.0	...	...	...	...	100	...	...	...	...

Materials for which no control measures were indicated are as follows: Mineral acids (45), Oils, fats and waxes (23), Lead and its compounds (22), Coal dust (bituminous) (12), Halogenated hydrocarbons (9), Silica dust (6), Cyanides (6), Alkaline compounds (6) and Temperature change (2).

Jewelry (Tables 71 and 71a)

This group is engaged in the manufacture of medals, pins, rings, etc., and the occupation, "jewelers", offers more exposures than all the other occupations combined. Local exhaust is the principal control measure for the exposures indicated in this group.

TABLE 71a—JEWELRY—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Other metals	Carbon monoxide	Other gases	Mineral acids	Non-silicious dusts	Silica dust	Cyandies	Silicate dusts	Organic dusts	Mercury and its compounds	Lacquers and varnishes
Number of workers exposed.....	104	80	80	54	35	33	28	15	11	4	1
General negative ventilation.....	6.8	7.5	7.5	...	17.1	...	...	40.0	...	...	...
Local exhaust	33.7	11.3	11.3	7.4	68.6	63.6	14.3	...	100.0	100.0	100.0
Enclosure	5.8	...	...	...	...	21.2	...	...	...	...	...
Wet method	1.0	...	...	...	...	...	...	6.7	...	...	...

Materials for which no control measures were indicated are as follows: Lead and its compounds (29), Alkaline compounds (16), Fluorides (4), Dyes (4), Sulfur (4), Petroleum products (3), Organic acids (3) and Inks (2).

Lead and Zinc (Tables 72 and 72a)

The manufacture of lead pigments is the leading type of industry in this group as is indicated by an exposure of 76.8% of the workers to lead. General negative ventilation, local exhaust, respirators, and protective clothing are used in combination with each other in the control of lead and its compounds. All organic acid exposures are controlled by general ventilation, local exhaust, and protective clothing.

TABLE 72—LEAD AND ZINC—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation								
	Lead and its compounds	Other metals	Other gases	Carbon monoxide	Organic acids	Coal dust (bituminous)	Temperature change	Petroleum products	Other chemicals
Total number of workers in plants surveyed, 181									
Number of workers exposed.....	139	88	26	26	23	19	8	6	3
Percent of workers exposed.....	76.8	21.0	14.4	14.4	12.7	10.5	4.4	3.3	1.7
Chemists	1	..	..	..	..	..	..	..	3
Drivers	2	..	..	..	..	..	..	..	..
Foremen	5	1	1	1	1	1	..	..	..
Furnace tenders	6	6	2	2	..	..	4	4	..
Laborers	70	9	..	..	22	..	..	12	..
Molders	18	18	18	18	..	18	..	..	..
Operators .....	..	4	4	4	..	..	4	..	..
Pressmen	8	..	..	..	..	..	..	..	..
Shippers	26	..	1	1	..	..	..	..	..
Wheel dressers	1	..	..	..	..	..	..	..	1
Winders	2	..	..	..	..	..	..	..	..

TABLE 72a—LEAD AND ZINC—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Lead and its compounds	Other metals	Other gases	Carbon monoxide	Organic acids	Other chemicals	Silica dust
Number of workers exposed.....	139	88	26	26	23	3	1
General negative ventilation.....	46.8	..	..	..	100.0	..	100.0
Local exhaust	59.0	55.3	84.6	92.3	100.0	33.3	..
Wet method	3.6	13.2	..	..	..	..	..
Respirator	45.3	..	..	..	..	..	100.0
Protective clothing	58.3	..	..	..	100.0	..	100.0

Materials for which no control measures were indicated are as follows: Coal dust (bituminous) (19), Temperature change (8) and Petroleum products (6).

Tin and Enamel Ware (Tables 73 and 73a)

Both vitreous enameling and tinsplating operations are included in this group. Other metals, silicate dusts, silica dust, and lead are the important exposures. The control methods are featured by a large percentage of wet methods, respirators, and protective clothing, in addition to local exhaust and general ventilation. Wet methods were credited to exposures where enamel was applied in a wet condition.

TABLE 73—TIN AND ENAMELWARE—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																											
	Other metals	Silicate dusts	Silica dust	Lead and its compounds	Fluorides	Carbon monoxide	Salts	Other gases	Petroleum products	Temperature change	Non-silicious dusts	Alkaline compounds	Other chemicals	Manganese and its compounds	Laqueurs and varnishes	Mineral acids	Organic dusts	Chromium and its compounds	Paints and enamels	Oils, fats, and waxes	Organic solvents	Hydrogen sulfide	Antimony and its compounds	Coal dust (bituminous)	Cyanides	Inks	Halogenated hydrocarbons	Benzol
Total number of workers in plants surveyed, 8,112	1,293	1,141	713	567	449	436	308	289	217	211	199	171	106	98	96	82	69	69	64	42	41	30	25	18	13	10	2	2
Number of workers exposed	1,293	1,141	713	567	449	436	308	289	217	211	199	171	106	98	96	82	69	69	64	42	41	30	25	18	13	10	2	2
Percent of workers exposed	39.6	36.7	22.9	18.2	14.4	14.0	9.9	9.3	7.0	6.8	6.4	5.5	3.4	3.1	3.1	2.6	2.2	2.2	2.1	1.3	1.3	1.0	0.8	0.6	0.4	0.3	0.1	0.1
Assemblers	30	15	15	36	30	30	30	15	15	30	30	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Baggers	36	36	36	36	30	30	30	30	36	36	36	5	5	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
Beaders	35	35	35	4	30	30	30	30	35	35	35	26	12	26	26	26	26	26	26	26	26	26	26	26	26	26	26	26
Brushers	28	28	12	4	18	18	18	17	17	17	17	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Burners	1	1	1	1	1	3	3	3	3	3	3	3	3	3	16	3	3	3	3	3	21	11	11	11	11	11	11	11
Cleaners	113	61	61	2	94	105	105	8	8	10	10	10	50	19	19	19	19	19	8	6	6	6	11	11	11	11	11	11
Dippers	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Enamel makers	188	188	188	334	188	188	188	15	15	173	173	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Enamelers	188	188	188	334	188	188	188	15	15	173	173	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Foundry workers	149	149	149	7	46	46	46	46	46	38	38	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Furnace tenders	33	41	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
Galvanizers	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Grinders	24	12	20	9	81	10	86	10	10	132	132	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Laborers	130	113	10	43	10	9	9	10	31	12	12	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Machinists	30	19	3	10	10	9	10	10	10	12	12	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Metal workers	13	6	3	10	10	10	10	10	10	12	12	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Mixers	12	14	8	8	8	8	15	15	15	6	6	8	6	13	6	6	6	6	4	4	25	30	30	30	30	30	30	30
Operators	57	40	17	53	12	56	12	56	121	6	6	17	17	17	17	17	17	17	2	2	4	4	4	4	4	4	4	4
Painters	17	15	15	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	31	31	4	4	4	4	4	4	4	4
Pickers	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Platers	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Polishers	159	18	159	12	12	12	12	12	42	4	4	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
Pressmen	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Rimmers	18	6	18	5	5	5	5	5	9	9	9	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Sand blasters	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
Shippers	6	11	11	20	5	20	5	5	9	9	9	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Smelters	10	22	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
Solders	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
Sprayers	11	13	2	14	4	4	2	3	3	3	3	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Strippers	11	13	2	14	4	4	2	3	3	3	3	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
Supervisors	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Technical men	12	12	12	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Timers	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33	33
Welders	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Other	9	6	1	1	1	13	13	14	14	14	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Maintenance	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

TABLE 73a—TIN AND ENAMELWARE—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Other metals	Silicate dusts	Silica dust	Lead and its compounds	Fluorides	Carbon monoxide	Salts	Other gases	Non-silicious dusts	Alkaline compounds	Other chemicals	Manganese compounds	Lacquers and varnishes	Mineral acids	Organic dusts	Chromium and its compounds	Paints and enamels	Organic solvents	Hydrogren sulfide	Antimony and its compounds	Cyanides	Halogenated hydrocarbons
Number of workers exposed....	1,283	1,141	713	567	449	486	308	289	199	171	105	98	96	82	69	69	64	41	30	25	18	8
General positive ventilation.....	1.2	6.7	8.8	...	...	...	...	...	...	8.2	59.0	14.3	...	...	...	20.3	...	...	...	...	...	...
General negative ventilation.....	4.5	9.6	8.8	...	...	6.4	1.9	20.1	...	29.8	87.6	46.9	...	52.4	...	66.7	26.6	...	100.0	...	61.5	...
Local exhaust	25.1	22.4	324	40.0	42.1	71.1	6.5	55.7	26.1	27.5	28.6	28.6	10.4	36.6	21.7	29.0	34.4	24.4	100.0	32.0	...	100.0
Enclosure	0.5	0.6	1.1	1.1	1.8	0.7	2.6	1.0	...	4.7	...	...	...	...	...	...	...	...	...	...	...	...
Wet method	14.7	16.7	5.4	4.2	310	...	48.1	...	4.5	18.7	...	22.4	...	...	...	11.6	...	...	...	96.0	...	...
Respirator	8.8	5.9	19.8	13.8	8.0	...	6.8	...	13.1	15.8	...	...	2.1	...	...	...	31.1	4.9	...	...	...	...
Pressure helmet	0.8	0.1	1.7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Protective clothing	6.7	...	...	...	...	...	6.2	...	...	24.6	...	14.8	...	34.1	...	20.3	...	...	...	...	61.6	...

Materials for which no control measures were indicated are as follows: Petroleum products (217), Temperature change (211), Oils, fats and waxes (42), Coal dust (bituminous) (18), Inks (10) and Benzol (2).

TABLE 74—ALUMINUM PRODUCTS—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																					
	Other metals	Silicate dusts	Carbon monoxide	Other gases	Silica dust	Core gases	Non-silicious dusts	Temperature change	Petroleum products	Organic dusts	Laquers and varnishes	Oils, fats, and waxes	Dermatitis producers	Paints and enamels	Inks	Organic solvents	Other chemicals	Mineral acids	Alkaline compounds	Coal dust (bituminous)	Halogenated hydrocarbons	Alcohols, esters, and ethers
Total number of workers in plants surveyed, 2,092																						
Number of workers exposed....	970	635	560	546	521	365	357	267	99	94	79	76	66	63	24	13	13	12	10	10	7	4
Percent of workers exposed.....	46.4	30.4	26.8	26.1	24.9	17.4	17.1	12.8	4.7	4.5	3.8	3.6	3.2	3.0	1.1	0.6	0.6	0.6	0.5	0.5	0.3	0.2
Buffers	92	16	...	...	12	2	72	...	...	34	...	...	12	...	...	...	...	1	...	...	7	...
Cleaners	8	67	68	68	67	76	7	...	...	...	65	68	...	...	...	...	...	...	...	...	...	...
Core makers .....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cutters	8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Die casters	137	137	137	137	22	21	24	96	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Furnace tenders	139	22	136	140	22	21	115	25	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Grinders	35	36	...	...	2	2	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Hammer men	25	...	25	25	...	...	...	25	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Heat treaters	22	16	38	38	16	...	...	22	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Inspectors .....	...	55	...	...	...	55	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Laborers	47	83	12	8	70	46	19	7	9	...	...	4	...	...	...	...	...	...	...	...	...	...
Machinists	124	90	13	9	...	1	34	...	25	4	...	...	...	...	...	...	...	...	...	...	...	...
Molders	58	137	67	67	137	137	11	1	...	...	...	3	...	55	...	...	...	2	...	...	...	...
Operators	11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Painters	7	...	7	7	...	...	...	...	...	...	...	...	...	8	...	...	...	...	...	...	...	...
Pattern makers	18	11	11	15	34	...	28	...	...	34	14	...	30	...	...	...	...	9	...	...	...	4
Reclaimers	5	...	...	...	...	...	...	...	...	5	...	...	...	...	...	...	...	...	...	...	...	...
Shippers .....	...	...	...	...	...	...	9	...	...	17	...	15	...	...	24	9	...	...	...	...	...	...
Spinners	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Supervisors	4	...	1	1	1	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Technicians	41	4	...	...	4	4	...	...	...	...	...	...	...	...	...	...	13	...	...	...	...	...
Trimmers	150	53	...	...	...	53	150	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Welders	24	20	23	24	20	...	...	...	...	...	...	...	9	...	...	...	...	...	...	...	...	...
Other	5	25	15	...	25	20	...	...	40	...	...	...	...	...	...	4	...	...	4	10	...	...
Maintenance .....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Aluminum Products (Tables 74 and 74a)

The manufacturing processes characteristic of this group are aluminum smelting, casting, buffing, grinding, and cleaning. The principal exposures, other metals, silicate dusts, carbon monoxide, other gases, and silica dust, as well as the occupations, are comparable to those encountered in iron foundries. Local exhaust is the only significant control measure.

TABLE 74a—ALUMINUM PRODUCTS—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Other metals	Silicate dusts	Carbon monoxide	Other gases	Silica dust	Core gases	Non-silicious dusts	Organic dusts	Oils, fats, and waxes	Dermatitis producers	Paints and enamels	Other chemicals	Mineral acids	Alkaline compounds	Halogenated hydrocarbons
Number of workers exposed	970	635	560	546	521	365	357	94	76	66	63	13	12	10	7
General negative ventilation	4.7	...	9.3	9.5	...	...	2.5	...	...	...	...	...	...	...	...
Local exhaust	41.4	21.4	12.1	10.4	4.0	0.8	53.5	56.4	...	...	1.6	100.0	16.7	...	100.0
Enclosure	1.5	...	...	...	0.6	...	...	...	...	...	...	...	...	...	...
Wet method	0.8	...	...	...	...	...	2.2	...	...	...	...	...	...	...	...
Respirator	4.0	0.5	...	...	0.6	...	8.1	...	...	...	1.6	...	...	...	...
Protective clothing	2.9	...	...	...	...	...	...	...	5.3	13.6	1.6	...	...	100.0	...

Materials for which no control measures were indicated are as follows: Temperature change (267), Petroleum products (99), Lacquers and varnishes (79), Inks (24), Organic solvents (13), Coal dust (bituminous) (10) and Alcohols, esters and ethers (4).

Electroplating (Tables 75 and 75a)

A relatively high exposure to a variety of materials, including other metals, chromium, non-silicious dusts, mineral acids, organic dusts, cadmium, cyanides, and alkaline compounds is noted. However, the only significant occupations are platers and polishers. Local exhaust, general negative ventilation, protective clothing, and "other" are important control measures. "Other" control measures includes the use of protective unguents among workers exposed to plating solutions.

Other (Tables 76 and 76a)

This group includes the fabrication of magnesium, tungsten, silver, nickel, other miscellaneous metal products, and also the assembly of various alloy products. The "other metals" exposure group, silica and silicate dusts, and the petroleum products, are the principal exposures. Local exhaust, respirators, and protective clothing are the important controls.

TABLE 75—ELECTROPLATING—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupations																								
	Other metals	Chromium and its compounds	Non-silicious dusts	Mineral acids	Organic dusts	Cadmium and its compounds	Cyanides	Alkaline compounds	Silica dust	Carbon monoxide	Other gases	Lead and its compounds	Dermatitis producers	Antimony and its compounds	Coal dust (bituminous)	Lacquers and varnishes	Organic acids	Silicate dusts	Halogenated hydrocarbons	Petroleum products	Other chemicals	Fluorides	Organic solvents	Paints and enamels	Sulfur
Total number of workers in plants surveyed, 554																									
Number of workers exposed	379	237	218	190	164	164	136	123	55	36	33	26	15	12	9	8	7	7	6	4	2	2	2	2	2
Per cent of workers exposed	68.4	42.8	39.4	34.3	29.6	29.6	24.5	22.2	9.9	6.5	6.0	4.7	2.7	2.2	1.6	1.4	1.3	1.3	1.1	0.7	0.4	0.4	0.4	0.4	0.4
Foremen	7	2	2	4	1	2	5	4	1	2	2	2	..	..	..	..	..	..	..	..	1	..	..	..	..
Grinders	14	4	10	..	6	4	..	..	..	..	4	..	4	..	..	..	..	2	4	..	..	..	..	..	..
Laborers .....	..	..	..	2	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Packers .....	..	..	..	..	7	..	..	1	..	1	1	..	2	..	..	..	..	..	..	..	..	..	..	..	..
Platers	136	134	4	177	..	68	130	33	..	17	15	24	..	12	..	..	..	..	..	..	..	..	..	..	2
Polishers	219	96	202	4	144	88	..	17	54	4	4	..	8	..	..	..	7	6	..	..	..	..	..	..	..
Sprayers .....	..	..	..	..	..	..	..	..	..	2	2	..	..	..	..	..	..	..	2	..	..	..	..	..	..
Tinners	2	..	..	2	..	..	..	2	..	2	8	..	..	..	..	8	..	..	..	..	..	2	2	..	..
Turnbriers .....	..	..	..	..	6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Washers .....	..	..	..	..	..	..	..	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Other .....	..	..	..	..	..	..	..	..	..	3	2	..	1	..	..	..	..	..	..	..	1	..	..	..	..
Maintenance	1	1	..	1	..	..	1	1	..	6	..	..	..	..	5	..	..	..	..	..	..	..	..	..	..

TABLE 75a.—ELECTROPLATING—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Sulfur																																						
	Other metals		Chromium and its compounds		Non-silicious dusts		Mineral acids		Organic dusts		Cadmium and its compounds		Cyanides		Alkaline compounds		Silica dust		Carbon monoxide		Other gases		Lead and its compounds		Dermatitis producers		Lacquers and varnishes		Organic acids		Silicate dusts		Halogens and hydrocarbons		Fluorides		Organic solvents		
Number of workers exposed.....	379	237	218	190	164	164	136	123	55	36	33	26	15	8	8	7	7	6	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	
General negative ventilation.....	29.6	30.0	20.6	41.1	18.3	17.1	35.3	17.9	5.5	25.0	27.3	7.7	100.0
Local exhaust	64.9	91.6	97.7	68.4	81.7	59.1	19.1	17.9	89.1	36.1	12.1	26.9	...	100.0	100.0	100.0	100.0
Enclosure	1.2
Respirator	0.8	1.3	...	...	...	...	...	...	...	...	...	...	...	75.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Protective clothing	28.2	35.4	3.2	62.6	...	36.6	69.6	59.3	...	...	6.1	50.0	26.7	25.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Other	0.5	5.1	...	7.4	...	...	8.8	8.8	...	...	6.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Materials for which no control measures were indicated are as follows: Antimony and its compounds (12), Coal dust (bituminous) (9), Petroleum products (4), Other chemicals (2) and Paints and enamels (2).

TABLE 76.—OTHER—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																									
	Other metals	Silicate dusts	Silica dust	Petroleum products	Other gases	Carbon monoxide	Core gases	Organic dusts	Oils, fats, and waxes	Non-silicious dusts	Lead and its compounds	Mineral acids	Paints and enamels	Antimony and its compounds	Organic solvents	Lacquers and varnishes	Chromium and its compounds	Alkaline compounds	Dermatitis producers	(cyanides	Temperature change	Coal dust (bituminous)	Cadmium and its compounds	Salts	Inks	Other chemicals
Number of workers exposed	280	180	173	140	131	114	72	42	37	36	34	26	23	20	16	14	14	13	12	10	8	8	8	7	6	4
Per cent of workers exposed	26.3	16.9	16.3	13.2	12.3	10.7	6.8	4.0	3.5	3.4	3.2	2.4	2.2	1.9	1.5	1.3	1.3	1.2	1.1	0.9	0.8	0.8	0.8	0.7	0.6	0.4
Assemblers	11	..	..	52	5	5	..	10	..	..	16	..	..	..	..	..	..	..	8	..	..	..	..	..	..	..
Carpenters .....	..	..	8	..	2	..	..	13	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..
Casters	2	..	..	..	..	2	..	..	..	..	..	2	1	..	..	..	..	..	..	..	..	..	..	4	..	..
Cleaners .....	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Foundry workers	10	65	68	1	25	25	51	..	24	..	..	..	..	..	..	..	..	5	..	..	6	..	..	..	..	..
Furnace men	4	4	4	..	4	9	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Grinders	72	62	50	..	..	..	..	..	2	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Heat treaters .....	..	..	..	..	..	10	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Laborers	33	21	26	3	8	23	16	..	5	8	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..
Machinists	4	..	..	16	..	..	..	..	..	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Metal workers	26	9	..	..	19	..	..	..	..	15	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Operators	22	5	..	42	10	10	..	1	..	8	4	..	..	10	4	..	..	..	1	..	..	..	..	..	4	..
Painters	3	..	3	..	8	3	..	..	..	..	..	..	20	..	..	..	..	..	..	..	..	..	..	..	..	..
Pattern makers	8	..	..	..	8	8	..	6	..	..	8	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Platers	4	..	..	..	2	2	..	..	..	..	..	8	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Polishers	30	..	5	..	..	..	..	9	6	5	..	..	..	6	6	..	..	..	..	7	..	..	8	..	..	..
Pressmen	4	1	..	..	..	..	..	..	..	..	..	..	..	..	3	..	..	..	..	..	..	..	..	..	..	..
Shippers	1	..	1	..	..	..	..	..	..	..	..	..	..	..	1	..	..	5	..	..	..	..	..	..	2	..
Solders	2	..	..	..	2	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Spinners	8	..	..	..	1	1	..	3	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..
Supervisors .....	..	2	2	..	..	..	1	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
Technical men	3	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Welders	16	..	..	..	16	6	..	..	..	..	3	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Other	10	..	..	..	..	..	..	..	..	..	3	..	1	..	..	..	..	..	..	..	..	5	..	..	..	..
Maintenance	12	10	..	24	6	6	..	..	..	1	..	..	..	..	..	6	..	..	..	..	..	5	..	..	..	..

LEATHER

Table 77 indicates the percentage of total exposures to specified materials in each industrial sub-division of this group. Dermatitis producers, organic solvents, and organic dusts show the greatest incidence of exposure. The sub-groups, leather belts and goods (Tables 78 and 78a), and trunks and suitcases (Tables 81 and 81a), are small and merit no special consideration. A large number of occupations are noted among the 5,060 workers surveyed in the shoe industry (Tables 79 and 79a), but the principal exposure, organic solvents, with 12.6%, shows a relatively low incidence in comparison to the principal exposures in other groups. Local exhaust is the only significant control measure indicated for the shoe industry. The tannery industry (Tables 80 and 80a) shows a high incidence of exposure to dermatitis producers and infections, which arise from the handling of hides and tanning materials. Protective clothing, consisting principally of gloves, boots, and aprons, is the major method of control in the tanneries.

TABLE 77—LEATHER—EXPOSURE TO SPECIFIED MATERIALS

Materials	Number of workers exposed to specified materials	Number and percentage of total exposures to the specified materials in each industrial subdivision							
		Leather belts and goods		Shoes		Tanneries		Trunks and suitcases	
		No.	%	No.	%	No.	%	No.	%
Dermatitis producers.....	824	88	10.7	162	19.7	512	62.1	62	7.5
Organic solvents.....	699	59	8.4	637	91.1	1	0.0	2	0.3
Organic dusts.....	602	127	21.1	383	63.6	64	10.6	23	4.7
Oils, fats and waxes.....	191	34	17.8	104	54.5	53	27.7	...	...
Infections.....	180	...	...	...	...	180	100.0	...	...
Other gases.....	143	17	11.9	113	79.0	10	7.0	3	2.1
Organic acids.....	129	4	3.1	...	...	125	96.9	...	...
Inks.....	118	3	2.5	115	97.5	...	...	...	...
Alcohols, esters and ethers.....	103	16	15.5	82	79.0	5	4.9	...	...
Dyes.....	100	13	13.0	57	57.0	30	30.0	...	...
Carbon monoxide.....	97	18	18.6	66	57.7	13	13.6	5	5.2
Non silicious dusts.....	90	...	...	70	77.8	10	11.1	10	11.1
Alkaline compounds.....	81	...	...	2	2.5	76	93.8	3	3.7
Petroleum products.....	79	7	8.9	17	21.5	55	69.6	...	...
Lacquers and varnishes.....	71	5	7.0	23	32.4	39	54.9	4	5.6
Silica dust.....	64	...	...	47	73.4	15	23.4	2	3.1
Benzol.....	64	...	...	64	100.0	...	...	...	...
Other metals.....	56	6	10.7	9	16.1	38	64.3	5	8.9
Salts.....	38	...	...	...	...	38	100.0	...	...
Coal dust (bituminous).....	26	1	3.8	15	57.7	8	30.8	2	7.7
Paints and enamels.....	17	3	17.6	2	11.8	12	70.5	...	...
Mineral acids.....	4	...	...	...	...	4	100.0	...	...
Amines.....	4	...	...	...	...	4	100.0	...	...
Silicate dusts.....	4	1	25.0	3	75.0	...	...	...	...
Sulfur dioxide.....	4	...	...	...	...	4	100.0	...	...
Halogenated hydrocarbons.....	4	...	...	4	100.0	...	...	...	...
Lead and its compounds.....	4	...	...	4	100.0	...	...	...	...

TABLE 78—LEATHER BELTS AND GOODS—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation													
	Organic dusts	Dermatitis producers	Organic solvents	Oils, fats, and waxes	Carbon monoxide	Other gases	Alcohols, esters, and ethers	Dyes	Petroleum products	Other metals	Lacquers and varnishes	Organic acids	Inks	Paints and enamels
Total number of workers in plants surveyed, 616	127	88	59	34	18	17	16	13	7	6	5	4	3	3
Per cent of workers exposed	24.6	17.1	11.4	6.6	3.5	3.3	3.1	2.5	1.4	1.2	1.0	0.8	0.6	0.6
Assemblers	...	...	...	...	...	...	...	...	...	...	...	...	3	...
Creasers	...	...	2	...	11	11	...	...	...	...	...	...	...	...
Curriers	8	4	...	...	...	...	...	...	3	...	...	4	...	...
Cutters	44	8	3	3	...	...	...	...	...	...	...	...	...	...
Embossers	...	...	...	...	5	5	...	...	...	...	...	...	...	...
Gluers	...	9	...	...	...	...	...	...	...	...	...	...	...	...
Harness makers	30	...	...	10	...	...	11	...	...	...	...	...	...	...
Inspectors	...	13	...	...	...	...	...	...	...	...	...	...	...	...
Pad makers	2	...	...	...	...	...	...	...	...	...	...	...	...	...
Painters	...	...	10	5	...	...	5	12	...	5	5	...	...	2
Pressers	15	18	1	2	...	...	...	...	...	...	...	...	...	...
Operators	1	2	...	12	...	...	...	...	...	...	...	...	...	...
Sewers	18	31	40	...	...	...	...	...	...	...	...	...	...	...
Shippers	6	3	8	...	...	...	...	...	...	...	...	...	...	...
Other	3	5	...	2	...	...	...	1	...	...	...	...	...	1
Maintenance	1	...	...	...	2	1	...	...	4	1	...	...	...	1

TABLE 78a—LEATHER BELTS AND GOODS—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Organic dusts	Organic solvents	Carbon monoxide	Alcohols, esters and ethers	Dyes	Other metals	Lacquers and varnishes
Number of workers exposed	127	59	18	16	13	6	5
General negative ventilation	...	6.8	...	25.0	30.8	66.7	80.0
Local exhaust	2.4	8.5	11.1	31.3	38.5	88.3	100
Enclosure	1.6	...	...	...	...	...	...

Materials for which no control measures were indicated are as follows: Dermatitis producers (88), Oils, fats and waxes (34), Other gases (17), Petroleum products (7), Organic acids (4), Inks (3), Paints and enamels (3), Coal dust (bituminous) (1) and Silicate dusts (1).

TABLE 79 — SHOES — EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																			
	Organic solvents	Organic dusts	Dermatitis producers	Inks	Other gases	Oils, fats, and waxes	Alcohols, esters and ethers	Non-silicious dusts	Benzol	Dyes	Carbon monoxide	Silica dust	Lacquers and varnishes	Petroleum products	Coal dust (bituminous)	Other metals	Halogenated hydrocarbons	Lead and its compounds	Silicate dusts	Alkaline compounds
Total number of workers in plants surveyed, 5,090	637	383	162	115	113	104	82	70	64	57	56	47	23	17	15	9	4	4	3	2
Number of workers exposed.....	12.6	7.6	3.2	2.3	2.2	2.1	1.6	1.4	1.3	1.1	1.1	0.9	0.5	0.3	0.8	0.2	0.1	0.1	0.1	0.0
Per cent of workers exposed.....	12.6	7.6	3.2	2.3	2.2	2.1	1.6	1.4	1.3	1.1	1.1	0.9	0.5	0.3	0.8	0.2	0.1	0.1	0.1	0.0
Assemblers	...	...	9	...	8	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Brushers	10	8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Buffers	23	23	...	...	...	1	...	1	...	3	...	5	...	...	...	...	...	...	...	...
Builders	...	...	30	...	...	...	...	...	...	8	...	...	...	...	...	...	...	...	...	...
Burnishers	...	5	...	...	...	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cementers	171	8	7	1	17	2	...	...	41	5	...	...	...	...	...	...	...	...	...	...
Cleaners	...	2	...	...	...	8	26	...	...	...	...	1	...	...	...	...	...	...	...	...
Coverers	62	2	...	...	...	...	30	...	...	...	...	...	...	...	...	...	...	...	...	...
Cutters	...	7	...	9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dippers	...	7	...	...	...	...	6	...	...	...	...	...	...	...	...	...	...	...	...	...
Dispatchers	8	...	...	...	8	...	...	...	8	...	...	...	...	...	...	...	...	...	...	...
Dressers	...	...	4	...	...	6	...	...	...	2	...	...	...	...	...	...	...	...	...	...
Fillers	19	15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Finishers	11	8	3	...	...	5	...	...	...	2	...	2	...	...	...	...	...	...	...	...
Fitters	2	2	...	...	...	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...
Folders	37	...	...	...	7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Heelers	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Inkers	8	4	56	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...
Inspectors	1	...	...	80	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...
Lasters	14	1	...	1	21	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Layers	23	...	2	...	...	...	1	...	...	...	...	1	...	...	...	...	...	...	1	...
Liners	22	...	...	...	8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Markers	23	...	8	35	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Molders	...	14	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Operators	63	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Painters	21	...	1	...	...	6	1	...	16	...	1	...	...	...	...	...	...	...	...	...
Pasters	50	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Polishers	...	4	23	...	...	23	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Reducers	...	6	...	...	...	16	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Repairmen	9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Roughers	...	30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Roughers	...	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Rounders	...	49	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Sanders	...	...	...	27	29	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Setters	...	3	...	2	...	...	...	...	...	...	30	...	...	...	...	...	...	...	...	...
Shippers	1	...	3	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...
Singers	...	...	...	...	7	...	...	...	...	...	7	...	...	...	...	...	...	...	...	...
Skivers	...	40	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Sprayers	...	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Stainers	...	...	...	...	...	12	...	...	...	...	...	...	7	...	...	...	...	...	...	...
Stitchers	...	6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Trees	...	...	...	...	...	7	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Trimmers	...	104	...	...	9	...	14	36	4	...	...	...	...	...	...	...	...	...	...	...
Other	29	20	6	6	1	5	4	5	...	...	1	...	...	...	...	...	...	...	...	...
Maintenance	...	13	2	1	3	...	...	2	...	...	17	2	3	14	15	3	...	4	...	2

TABLE 80.—TANNERIES—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																					
	Total number of workers in plants surveyed, 718																					
	Dermatitis producers	Infections	Organic acids	Alkaline compounds	Organic dusts	Petroleum products	Oils, fats, and waxes	Lacquers and varnishes	Salts	Other metals	Dyes	Carbon monoxide	Silica dust	Paints and enamels	Non-silicious dusts	Other gases	Coal dust (bituminous)	Alcohols, esters, and ethers	Amines	Mineral acids	Sulfur dioxide	Organic solvents
Number of workers exposed.....	512	180	125	76	64	55	53	39	38	36	30	18	15	12	10	10	8	5	4	4	4	1
Per cent of workers exposed....	71.3	25.1	17.4	10.6	8.9	7.7	7.4	5.4	5.3	5.0	4.2	2.5	2.1	1.7	1.4	1.4	1.1	0.7	0.6	0.6	0.6	0.1
Bleachers	4	..	4	..	22	..	..	..	..	..	..	..	15	..	..	..	..	..	..	4	..	..
Buffets	17	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Embossers	28	..	3	..	7	..	..	..	..	4	4	..	..	..	..	..	..	5	..	..	..	..
Grinders	..	..	..	..	..	11	5	11	10	20	5	..	..	..	..	..	..	..	..	..	..	..
Laborers	92	73	40	18	..	13	12	..	10	..	..	..	..	..	..	..	..	..	..	..	..	..
Oilers	13	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Operators	22	8	..	4	..	..	..	..	4	..	..	..	..	..	..	..	..	..	4	..	..	..
Packers	21	..	..	..	19	10	12	..	..	12	10	..	..	..	12	10	..	..	..	..	..	..
Pastors	97	22	1	1	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Scudders	83	2	82	18	5	20	22	..	4	..	..	..	..	..	..	..	..	..	..	..	..	..
Setters	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Shippers	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Smelters	..	..	..	..	..	..	..	24	10	..	..	10	..	..	..	10	..	..	..	..	..	..
Soakers	60	36	..	13	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Splitters	30	10	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Tackers	28	..	..	..	..	..	..	..	..	..	9	..	..	..	..	..	..	..	..	..	..	..
Tanners	37	5	36	..	10	10	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Trimmers	22	18	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Washers	9	1	8	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Other	1	3	1	2	3	..	..	..	..	..	2	8	..	..	..	..	8	..	..	..	..	..
Maintenance	..	..	..	..	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1

TABLE 79a—SHOES—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Organic solvents	Organic dusts	Dermatitis producers	Oils, fats and waxes	Alcohols, esters and ethers	Non-silicious dusts	Benzol	Dyes	Carbon monoxide	Silica dust	Lacquers and varnishes	Other metals
Number of workers exposed....	637	383	162	104	82	70	64	57	56	47	23	9
Local exhaust.....	2.5	62.7	...	10.6	...	87.1	3.1	40.4	26.8	87.2	4.3	33.3
Enclosure .....	...	...	...	...	...	5.7	...	...	...	...	...	44.4
Protective clothing.....	1.4	...	4.9	7.7	18.3	...	...	1.8	...	...	...	...

Materials for which no control measures were indicated are as follows: Inks (115), Other gases (113), Petroleum products (17), Coal dust (bituminous) (15), Halogenated hydrocarbons (4), Lead and its compounds (4), Silicate dusts (3), Alkaline compounds (2) and Paints and enamels (2).

TABLE 80a—TANNERIES—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Dermatitis producers	Infections	Organic acids	Alkaline compounds	Organic dusts	Oils, fats, and waxes	Lacquers and varnishes	Other metals	Dyes	Carbon monoxide	Silica dust	Paints and enamels	Other gases
Number of workers exposed	512	180	125	76	64	53	39	36	30	18	15	12	10
General negative ventilation .....	...	...	...	...	18.8	...	...	...	...	...	...	...	...
Local exhaust .....	...	...	...	...	26.6	...	28.2	...	...	100	100	...	100
Respirator .....	...	...	...	...	...	...	12.8	...	...	...	...	...	...
Protective clothing	3.7	7.8	8.8	23.4	...	32.1	...	33.3	16.7	...	...	100	...

Materials for which no control measures were indicated are as follows: Petroleum products (55), Salts (38), Non-silicious dusts (10), Coal dust (bituminous) (8), Alcohols, esters and ethers (5), Amines (4), Mineral acids (4), Sulfur dioxide (4) and Organic solvents (1).

TABLE 81 — TRUNKS AND SUITCASES — EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

	Number of workers exposed to specified materials by occupation										
Occupations	Dermatitis pro- ducers	Organic dusts	Non-silicious dusts	Carbon monoxide	Other metals	Lacquers and varnishes	Other gases	Alkaline compounds	Coal dust (bitu- minous)	Silica dust	Organic solvents
Total number of workers in plants surveyed, 177											
Number of workers exposed.....	62	28	10	5	5	4	3	3	2	2	2
Per cent of workers exposed.....	35.0	15.8	5.6	2.8	2.8	2.3	1.7	1.7	1.1	1.1	1.1
Box makers.....	..	2	..	..	..	..	..	..	..	..	..
Cutters	7	11	..	..	..	..	..	..	..	..	..
Finishers	10	..	..	..	..	..	..	..	..	..	..
Gluers	20	..	..	..	..	..	..	..	..	..	..
Liners	5	..	..	..	..	..	..	..	..	..	..
Luggage makers.....	6	2	..	..	..	..	..	..	..	..	..
Markers .....	..	4	..	..	..	..	..	..	..	..	..
Mounters	3	..	..	..	..	..	..	..	..	..	..
Operators	8	8	8	..	..	..	..	..	..	..	..
Painters .....	..	..	..	..	..	1	..	..	..	..	..
Pattern makers.....	..	..	..	..	..	..	..	..	..	2	..
Repairmen .....	..	..	..	..	..	..	..	..	..	..	2
Sewers	3	..	..	..	..	..	..	..	..	..	..
Maintenance .....	..	1	2	5	5	3	3	3	2	..	..

TABLE 81a — TRUNKS AND SUITCASES — PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Organic dusts	Carbon monoxide	Other metals	Lacquers and varnishes
Number of workers exposed.....	23	5	5	4
Local exhaust.....	35.7	40.0	..	100.0
Protective clothing.....	..	..	60.0	75.0

Materials for which no control measures were indicated are as follows: Dermatitis producers (62), Non-silicious dusts (10), Other gases (3), Alkaline compounds (3), Coal dust (bituminous) (2), Silica dust (2) and Organic solvents (2).

LUMBER AND FURNITURE

Table 82 indicates the percentage of total exposures to specified materials for each industrial sub-division in the lumber group. As one would expect, the most important exposure in this industry is organic dusts. The plants listed under wood, wicker, and upholstered furniture (Tables 83 and 83a), other furniture (Tables 85 and 85a), planing and milling (Tables 86 and 86a), and other woodworking (Tables 87 and 87a), are similar in most of their exposures which include such materials as dermatitis producers, lacquers and varnishes, and silica dust. The group, metal furniture (Tables 84 and 84a), however, shows exposures such as other metals, carbon monoxide, and other gases which are characteristic of metal fabrication. Local exhaust is the principal control measure in all of the industries listed under lumber and furniture.

TABLE 82—LUMBER AND FURNITURE—EXPOSURE TO SPECIFIED MATERIALS

Materials	Number of workers exposed to specified materials	Number and Percentage of Total Exposures to the Specified Materials in Each Industrial Subdivision									
		Wood, wicker and upholstered furniture		Metal furniture		Other furniture		Planing and milling		Other wood-working	
		No.	%	No.	%	No.	%	No.	%	No.	%
Organic dusts.....	2,542	737	29.0	301	11.8	163	6.4	388	15.3	953	37.5
Dermatitis producers.....	717	120	16.7	164	22.9	108	15.1	113	15.8	212	29.6
Lacquers and varnishes.....	577	105	18.2	278	48.2	38	6.6	6	1.0	150	26.0
Other metals.....	564	27	4.8	407	72.0	47	8.3	10	1.8	73	12.9
Silica dust.....	553	116	21.0	142	25.7	20	3.6	87	15.7	188	34.0
Carbon monoxide.....	483	44	9.0	254	52.0	24	4.9	13	2.7	153	31.4
Other gases.....	414	23	5.6	277	66.9	31	7.5	6	1.4	77	18.6
Paints and enamels.....	401	44	11.0	254	63.8	39	9.7	39	9.7	26	6.2
Petroleum produces.....	319	11	3.4	247	77.4	11	3.4	5	1.6	45	14.1
Non-silicious dusts.....	298	13	4.4	99	33.2	42	14.1	9	3.0	135	45.3
Organic solvents.....	281	48	17.1	83	29.5	6	2.1	17	6.0	127	45.2
Lead and its compounds.....	182	11	6.0	109	59.9	17	9.3	9	4.9	36	19.8
Silicate dusts.....	174	20	11.5	85	48.9	18	10.3	17	9.8	34	19.5
Dyes.....	153	29	19.0	73	47.7	11	7.2	...	...	40	26.1
Oils, fats and waxes.....	152	9	5.9	28	18.4	2	1.3	7	4.6	106	69.7
Coal dust (bituminous).....	110	21	19.1	30	27.3	9	8.2	20	18.2	80	27.3
Inks.....	66	2	2.3	35	40.7	3	3.5	29	33.7	17	19.8
Alcohols, esters and ethers.....	73	13	17.8	3	4.1	4	5.5	1	1.4	52	71.2
Mineral acids.....	59	...	...	39	66.1	9	15.3	4	6.8	7	11.9
Chromium and its compounds.....	32	...	...	32	100.0	...	...	...	...	...	...
Cadmium and its compounds.....	32	...	...	32	100.0	...	...	...	...	...	...
Core gases.....	30	...	...	22	73.3	...	...	...	...	8	26.7
Alkaline compounds.....	25	1	4.0	18	72.0	1	4.0	3	12.0	7	28.0
Cyanides.....	22	...	...	22	100.0	...	...	...	...	...	...
Temperature change.....	9	...	...	...	...	...	...	...	...	9	100.0
Coal tar products.....	7	...	...	3	42.9	...	...	...	...	4	57.1
Salts.....	7	...	...	7	100.0	...	...	...	...	...	...
Organic acids.....	6	...	...	6	100.0	...	...	...	...	...	...
Fluorides.....	6	...	...	6	100.0	...	...	...	...	...	...
Arsenic and its compounds.....	6	...	...	6	100.0	...	...	...	...	...	...
Antimony and its compounds.....	6	...	...	6	100.0	...	...	...	...	...	...
Benzol.....	5	2	40.0	3	60.0	...	...	...	...	...	...
Aldehydes.....	3	...	...	3	100.0	...	...	...	...	...	...
Halogenated hydrocarbons.....	2	...	...	2	100.0	...	...	...	...	...	...
Other chemicals.....	1	...	...	...	...	...	...	...	...	1	100.0

TABLE 83a—WOOD, WICKER AND UPHOLSTERED FURNITURE—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Organic dusts	Silica dust	Lacquers and varnishes	Organic solvents	Paints and enamels	Carbon monoxide	Dyes	Other metals	Other gases	Non-silicious dusts	Lead and its compounds	Petroleum products
Number of workers exposed....	737	116	105	48	44	44	29	27	23	13	11	11
General negative ventilation.....	10.0	1.7	5.7	...	6.3	13.2	6.9	29.6	8.7	...	72.7	...
Local exhaust.....	22.4	51.7	81.9	43.8	72.7	61.4	17.2	...	30.4	46.2	9.1	...
Respirator.....	0.8	5.2	9.5	...	2.3	...	10.3	...	...	...	...	...
Protective clothing.....	...	...	2.9	...	...	...	10.3	29.6	...	...	...	13.2

Materials for which no control measures were indicated are as follows: Dermatitis producers (120), Coal dust (bituminous) (21), Silicate dusts (20), Alcohols, esters and ethers (13), Oils, fats and waxes (9), Inks (2), Benzol (2) and Alkaline compounds (1).

TABLE 84a—METAL FURNITURE.—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

[illegible]

Materials for which no control measures were indicated are as follows: Dermatitis producers (164), Irls (35), Coal dust (bituminous) (30), Oils, fats and waxes (28), Benzol (3) and Halogenated Hydrocarbons (2).

TABLE 84—METAL FURNITURE—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation															
	Total number of workers in plants surveyed, 3,020	Other metals	Organic dusts	Lacquers and varnishes	Other gases	Paints and enamels	Carbon monoxide	Petroleum products	Dermatitis producers	Silica dust	Lead and its compounds	Non-silicious dusts	Silicate dust	Organic solvents	Dyes	Mineral acids
Number of workers exposed	407	301	278	277	254	254	247	164	142	109	99	85	88	73	89	
Percent of workers exposed	18.5	10.0	9.2	9.2	8.4	8.4	8.2	5.4	4.7	3.6	3.3	2.8	2.7	2.4	1.3	
Assemblers	87	51	...	73	...	86	28	56	...	21	...	6	20	...	6	
Buffers	46	44	4	...	3	...	...	...	3	...	33	1	...	...	...
Core makers ....	...	...	...	2	...	2	...	...	2	...	...	2	...	...	...
Cutters .....	...	5	...	...	...	...	...	...	...	...	...	...	...	...	...
Finishers .....	...	...	88	...	72	...	...	2	3	2	...	17	...	14	...
Forgers .....	...	...	...	13	...	13	13	...	...	...	...	...	...	...	...
Grinders	22	...	...	...	...	...	...	...	3	5	19	4	...	...	...
Laborers	10	7	19	10	15	10	19	...	10	...	3	10	19	...	...
Machinists	59	...	...	...	...	...	20	...	...	...	35	24	...	...	...
Mixers .....	...	...	3	...	...	...	...	3	...	...	...	...	3	...	...
Molders	10	...	...	10	...	12	...	...	10	2	...	10	...	...	...
Operators	20	87	5	6	2	6	107	...	40	1	...	5	24	...	...
Painters	3	...	153	21	157	21	...	...	3	3	...	...	12	54	...
Platers	22	...	...	2	...	...	...	...	...	11	...	...	...	...	19
Pressmen .....	...	...	...	...	...	...	...	28	...	10	...	...	...	...	...
Printers .....	...	...	...	...	...	...	3	3	...	...	...	...	3	...	...
Sanders	4	15	2	...	...	...	...	...	19	2	...	2	...	...	...
Shippers .....	...	25	...	...	...	4	5	2	...	...	...	...	...	...	...
Sheet metal workers	14	...	...	26	...	26	7	...	...	32	9	4	...	...	12
Supervisors	1	...	...	...	...	...	...	...	...	1	...	...	...	...	...
Upholsterers ..	...	18	...	...	...	...	...	23	...	...	...	...	...	...	...
Washers .....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
Welders	108	...	...	114	...	47	...	...	...	4	...	...	...	...	...
Wood workers ..	...	86	4	...	...	...	...	41	47	...	...	...	...	...	...
Other	1	5	...	...	5	2	...	6	2	11	...	...	2	5	...
Maintenance ...	...	8	...	...	...	25	45	...	...	4	...	...	...	...	...

TABLE 85—OTHER FURNITURE—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																			
	Organic dusts	Dermatitis producers	Other metals	Non-silicious dusts	Paints and enamels	Lacquers and varnishes	Other gases	Carbon monoxide	Silica dust	Silicate dusts	Lead and its compounds	Dyes	Petroleum products	Mineral acids	Coal dust (bituminous)	Organic solvents	Alcohols, esters, and ethers	Inks	Oils, fats, and waxes	Alkaline compounds
Total number of workers in plants surveyed, 420																				
Number of workers exposed	163	108	47	42	39	38	31	24	20	18	17	11	11	9	9	6	4	3	2	1
Percent of workers exposed	38.8	25.7	11.2	10.0	9.3	9.0	7.4	5.7	4.8	4.3	4.0	2.6	2.6	2.1	2.1	1.4	1.0	0.7	0.5	0.2
Assemblers	3	6	2	8	8	11	...	...	3	...	...	...	...	...	...	...	...	...	...	...
Cabinet makers	78	77	...	4	...	...	...	...	...	7	...	...	...	...	...	...	...	4	...	...
Glaziers	9	...	...	9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Laborers	3	6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Machinists	4	...	3	8	...	...	3	...	4	...	...	...	5	...	...	...	...	...	...	...
Metal workers	...	...	24	13	...	...	21	8	...	...	14	...	...	9	...	...	...	...	...	...
Painters	21	4	...	3	...	...	...	...	4	...	...	...	4	...	...	...	...	...	...	...
Polishers	14	...	...	36	36	36	...	...	6	...	...	6	...	...	...	6	...	...	...	...
Polsters	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Shippers	3	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...
Supervisors	6	2	4	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Upfitters	2	2	2	2	1	1	1	1	...	...	...	...	...	...	...	...	...	...	...	...
Welders	7	...	...	...	...	...	6	6	5	...	...	...	...	...	...	...	...	...	...	...
Wood workers	20	9	5	1	...	...	...	...	...	1	...	1	...	...	...	...	...	...	...	...
Other	2	3	...	...	...	...	...	...	2	...	...	...	2	...	...	...	...	...	1	...
Maintenance	3	...	7	3	...	...	...	9	...	...	3	...	4	...	9	...	...	...	2	...

TABLE 86—PLANING AND MILLING—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																		
	Organic dusts	Dermatitis producers	Silica dust	Paints and enamels	Inks	Coal dust (bituminous)	Silicate dusts	Organic solvents	Carbon monoxide	Other metals	Lead and its compounds	Non-silicious dusts	Oils, fats, and waxes	Other gases	Lacquers and varnishes	Petroleum products	Mineral acids	Alkaline compounds	Alcohols, esters, and ethers
Number of workers exposed.....	388	113	87	39	29	21	17	17	1.3	1.0	0.9	0.9	0.7	0.6	0.6	0.5	0.4	0.3	1
Per cent of workers exposed.....	38.6	11.3	8.7	3.9	2.9	2.1	1.7	1.7	1.3	1.0	0.9	0.9	0.7	0.6	0.6	0.5	0.4	0.3	0.1
Bench men.....	19	37	5	...	8	...	...	...	...	...	8	...	...	...	...	...	...	...	...
Box makers.....	20	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...
Cabinet makers.....	37	8	...	20	...	...	5	...	...	...	...	...	...	...	...	...	...	...	...
Carpenters.....	12	5	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Coopers.....	12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Foremen.....	10	...	1	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...
Glaziers.....	...	...	...	5	...	...	...	3	...	1	1	6	5	...	...	2	...	...	1
Laborers.....	25	...	...	...	...	3	1	3	...	1	1	1	1	...	...	...	...	...	...
Machine men.....	2	30	17	9	15	...	6	...	...	2	...	2	1	...	...	...	...	...	...
Mill men.....	120	...	19	...	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Nailers.....	11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Operators.....	81	8	17	...	7	...	...	6	...	...	...	...	...	...	4	...	...	...	...
Sawyers.....	...	...	6	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...
Shippers.....	61	13	18	...	...	...	...	3	...	...	...	...	...	...	...	...	...	...	...
Truckers.....	...	...	...	...	...	5	...	1	...	...	...	...	...	...	...	2	...	...	...
Wood workers.....	10	1	4	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...
Other.....	17	10	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Maintenance.....	1	...	2	3	...	11	3	1	13	6	5	...	...	6	1	1	4	1	...

TABLE 85a—OTHER FURNITURE—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Organic dusts	Other metals	Non-silicious dusts	Paints and enamels	Lacquers and varnishes	Other gases	Carbon monoxide	Silica dust	Silicate dusts	Dyes	Organic solvents
Number of workers exposed.....	163	47	42	39	38	31	24	20	18	11	6
General negative ventilation.....	4.9	...	...	7.7	13.2	...	...	...	...	...	...
Local exhaust.....	31.9	8.6	11.9	51.8	42.1	3.2	41.7	40.0	...	9.1	...
Enclosure	0.6	...	2.4	...	...	...	...	...	...	...	...
Wet method.....	1.8	...	16.7	...	...	...	...	15.0	38.9	...	...
Respirator	2.4	...	...	28.2	18.4	...	...	...	...	...	...
Protective clothing .....	...	19.1	...	23.1	13.7	...	...	...	...	...	...

Materials for which no control measures were indicated are as follows: Dermatitis producers (108), Lead and its compounds (17), Petroleum products (11), Mineral acids (9), Coal dust (bituminous) (9), Alcohols, esters and ethers (4), Inks (3), Oils, fats and waxes (2) and Alkaline compounds (1)

TABLE 86a—PLANING AND MILLING—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Organic dusts	Silica dust	Paints and enamels	Organic solvents	Carbon monoxide	Other metals	Lacquers and varnishes
Number of workers exposed	388	87	39	17	13	10	6
General negative ventilation	8.0	2.3	....	....	....	....	....
Local exhaust	68.8	79.6	2.6	29.4	84.6	....	83.3
Protective clothing .....	....	....	....	....	....	40.0	....

Materials for which no control measures were indicated are as follows: Dermatitis producers (113), Inks (29), Coal dust (bituminous) (20), silicate dusts (17), Lead and its compounds (9), Non-silicious dusts (9), Oils, fats and waxes (7), Other gases (6), Petroleum products (5), Mineral acids (4), Alkaline compounds (3) and Alcohols, esters and ethers (1).

TABLE 87—OTHER WOODWORKING—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																							
	Organic dusts	Dermatitis producers	Silica dust	Carbon monoxide	Lacquers and varnishes	Non-silicious dusts	Organic solvents	Oils, fats, and waxes	Other gases	Other metals	Alcohols, esters and ethers	Petroleum and products	Dyes	Lead and its compounds	Silicate dusts	Coal dust (bituminous)	Paints and enamels	Inks	Temperature change	Core gases	Alkaline compounds	Mineral acids	Coal tar products	Other chemicals
Total number of workers in plants surveyed, 2,444																								
Number of workers exposed	933	212	188	153	150	135	127	106	77	73	52	45	40	36	34	30	25	17	9	8	7	7	4	1
Percent of workers exposed	39.0	8.7	7.7	6.3	6.1	5.5	5.2	4.3	3.2	3.0	2.1	1.8	1.6	1.5	1.4	1.2	1.0	0.7	0.4	0.3	0.3	0.3	0.2	0.0
Assemblers	54	..	..	11	5	32	..	..	11	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Cabinet makers	45	26	7	15	..	..	..	..	7	..	3	..	..	..	2	4	..	..	..	..	..	..	..	..
Coopers	52	..	..	..	..	..	60	..	4	..	..	..	..	..	15	5	..	..	..	..	4	..	..	..
Coverers	4	6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Finishers	42	..	3	14	2	15	53	..	7	6	..	..	..	..	..	..	..	..	6	..	..	..	..	..
Forgers	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Graders	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Grinders	4	..	4	..	..	2	..	..	..	6	..	..	2	..	5	..	..	..	..	..	..	..	..	..
Inspectors	15	..	7	..	..	..	..	..	..	..	..	..	..	..	..	..	..	7	..	..	..	..	..	..
Laborers	45	..	..	3	8	..	..	..	3	6	4	2	..	8	..	..	..	..	3	..	..	..	..	..
Mill men	16	..	16	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Operators	128	14	25	5	1	5	..	7	1	13	..	5	..	1	..	..	..	..	..	..	1	..	4	..
Organ men	6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Other wood workers	165	7	4	..	..	1	..	..	..	1	..	2	..	..	..	..	1	..	..	..	..	..	..	..
Painters	11	..	2	13	35	..	2	1	10	..	..	..	38	14	..	..	24	..	..	..	..	..	..	..
Pattern makers	158	75	86	15	93	47	3	3	7	18	..	..	..	4	11	..	..	..	..	8	..	6	1	1
Pressmen	4	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Regulators	20	..	..	16	..	..	..	..	..	..	16	..	..	..	..	..	..	..	..	..	..	..	..	..
Sanders	37	..	40	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Saw men	46	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..
Shippers	3	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Supervisors	15	10	1	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..
Vener men	15	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Wax workers	19	..	..	..	..	..	..	19	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Other	28	18	1	8	..	..	..	8	1	3	2	..	..	6	1	..	..	9	..	..	..	1	..	..
Maintenance	35	16	8	32	..	27	10	26	23	32	6	34	..	8	..	21	..	..	..	..	..	..	..	..

TABLE 87a—OTHER WOODWORKING—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Organic dusts	Dermatitis producers	Silica dust	Carbon monoxide	Lacquers and varnishes	Non-silicious dusts	Organic solvents	Oils, fats, and waxes	Other gases	Other metals	Dyes	Lead and its compounds	Silicate dusts	Paints and enamels,	Alkaline compounds
Number of workers exposed	953	212	188	153	150	135	127	106	77	73	40	36	34	25	7
General positive ventilation	0.6	0.5	6.4	...	0.7	...	...	...	13.0	13.7	...	2.8	...	...	...
General negative ventilation	11.0	...	0.5	21.7	8.0	...	47.2	...	36.4	...	...	...	...	48.0	57.1
Local exhaust	58.2	...	50.5	45.8	30.6	39.3	0.8	0.9	32.5	15.1	2.5	11.1	14.7	52.0	57.1
Enclosure .....	...	...	...	6.5	...	...	...	...	13.0	...	...	...	...	...	...
Wet method .....	...	...	...	...	...	...	...	...	...	1.4	...	...	2.9	...	...
Respirator	0.1	...	2.7	...	9.3	...	...	...	...	...	...	5.6	...	52.0	...
Protective clothing.....	...	...	...	...	...	...	...	...	...	1.4	...	...	...	...	...

Materials for which no control measures were indicated are as follows: Alcohols, esters and ethers (52), Petroleum products (45), Coal dust (bituminous) (30), Inks (17), Temperature change (9), Core gases (8), Mineral acids (7), Coal tar products (4) and Other chemicals (1).

PAPER, PRINTING, AND ALLIED

Table 88 indicates the number and percentage of total exposures to the specified materials for each sub-group of the paper and printing industry. Inks, petroleum products, organic solvents, organic dusts, and lead are the principal exposures indicated. The industries comprising this group are widely divergent in character including, for example, paper and pulp mills, as contrasted to engraving and photographic work.

TABLE 88—PAPER, PRINTING AND ALLIED—EXPOSURE TO SPECIFIED MATERIALS

Material	Number of workers exposed to specified materials	Number and percentage of total exposures to the specified materials in each industrial subdivision									
		Blank books and paper products		Paper and pulp mills		Paper box factories		Engraving and photo-graphic work		Printing and publishing	
		No.	%	No.	%	No.	%	No.	%	No.	%
Inks	2,347	159	6.8	23	1.0	238	10.1	101	4.3	1,826	77.8
Petroleum products	1,713	120	7.0	84	4.0	85	5.0	40	2.3	1,384	80.8
Organic solvents	1,282	20	2.3	12	0.9	68	5.3	87	6.8	1,086	84.7
Organic dusts	1,047	177	16.9	343	32.8	254	24.3	31	3.9	232	22.2
Lead and its compounds...	954	19	2.0	3	0.3	18	1.9	33	3.5	881	92.3
Dermatitis producers	902	58	6.4	9	1.0	269	29.8	82	9.1	484	53.7
Other metals	759	25	3.3	38	5.0	30	4.0	104	13.7	562	74.0
Carbon monoxide	505	40	7.9	60	11.9	33	6.5	16	3.2	356	70.5
Other gases	483	34	7.0	47	9.7	21	4.3	21	4.3	360	74.5
Silicate dusts	364	66	18.1	146	40.1	16	4.4	8	2.2	128	35.2
Benzol	285	5	1.8	3	1.1	4	1.4	68	23.9	205	71.9
Dyes	266	71	26.7	177	66.5	6	2.3	8	3.0	4	1.5
Alkaline compounds	261	24	9.2	103	39.5	44	16.9	31	11.9	59	22.6
Mineral acids	238	1	0.4	69	29.0	...	...	97	40.8	71	29.8
Other chemicals	213	6	2.7	5	2.3	2	0.9	160	75.1	40	18.8
Halogenated hydrocarbons..	195	...	...	...	...	...	...	...	...	195	100.0
Oils, fats and waxes	151	38	25.2	...	...	...	...	7	4.6	106	70.2
Lacquers and varnishes ...	133	43	32.3	12	9.0	16	12.0	11	8.3	51	38.3
Non-silicious dusts	129	14	10.9	5	3.9	13	10.1	12	9.3	85	65.9
Salts	123	...	...	75	61.0	...	...	14	11.4	34	27.6
Coal dust (bituminous)....	112	22	19.6	55	49.1	10	8.9	1	0.9	24	21.4
Paints and enamels	70	...	...	...	...	2	2.9	30	42.9	38	54.3
Cyanides	55	...	...	...	...	...	...	8	14.5	47	85.5
Organic acids	49	16	32.7	...	...	...	...	16	32.7	17	32.7
Silica dust.....	37	2	5.4	12	32.4	...	...	8	21.6	15	40.5
Alcohols, esters and ethers	30	14	46.7	...	...	...	...	10	33.3	6	20.0
Chromium and its compounds	24	...	...	...	...	...	...	17	70.8	7	29.2
Coal tar products	21	...	...	12	57.1	...	...	...	...	9	42.9
Fluorides	10	...	...	...	...	...	...	...	...	10	100.0
Cadmium and its compounds	10	...	...	...	...	...	...	...	...	10	100.0
Aldehydes	7	7	100.0	...	...	...	...	...	...	...	...
Antimony and its compounds	1	...	...	...	...	...	...	...	...	1	100.0
Sulfur	1	...	...	...	...	...	...	1	100.0	...	...

Blank Books and Paper Products (Tables 89 and 89a)

The principal exposures are organic dusts, inks, and petroleum products. The occupation, "operators", applying to various types of machine operations, accounts for nearly one-half of the exposures. General negative ventilation and local exhaust are extensively used as control measures in this group.

TABLE 90—PAPER AND PULP MILLS—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																				
	Organic dusts	Dyes	Silicate dusts	Alkaline compounds	Petroleum products	Salts	Mineral acids	Carbon monoxide	Coal dust (bituminous)	Other gases	Other metals	Inks	Coal tar products	Silica dust	Lacquers and varnishes	Organic solvents	Dermatitis producers	Other chemicals	Non-silicious dusts	Lead and its compounds	Benzol
Total number of workers in plants surveyed, 1,170	343	177	146	108	84	75	69	60	55	47	38	23	12	12	12	12	12	5	5	3	3
Number of workers exposed	29.3	15.1	12.5	8.8	7.2	6.4	5.9	5.1	4.7	4.0	3.2	2.0	1.0	1.0	1.0	1.0	0.8	0.4	0.4	0.3	0.3
Percent of workers exposed	29.3	15.1	12.5	8.8	7.2	6.4	5.9	5.1	4.7	4.0	3.2	2.0	1.0	1.0	1.0	1.0	0.8	0.4	0.4	0.3	0.3
Beater engineers	18	18	24	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
Box makers	19	6	1	1	1	1	1	1	1	5	1	1	1	1	1	1	1	5	1	1	1
Chemists	2	2	3	3	6	6	6	6	1	1	1	1	1	1	1	1	1	1	1	1	1
Foremen	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Heaters	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Hookers	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Labors	41	41	34	34	1	14	6	5	12	12	12	12	12	12	12	12	12	12	12	12	12
Machine feeders	12	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21
Mixers	21	21	21	21	13	13	13	4	22	14	14	14	14	14	14	14	14	14	14	14	14
Operators	112	76	61	61	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Paper makers	30	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Printers	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Rotary men	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Shippers	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
Sorters	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
Truckers	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Other	1	5	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Maintenance	8	27	5	60	2	2	56	49	20	38	3	3	3	2	2	2	5	5	5	5	5

Paper and Pulp Mills (Tables 90 and 90a)

Organic dusts, dyes, silicate dusts, and alkaline compounds are the principal exposures. In certain procedures where the use of water is an inherent part of the process, exposures were credited with wet methods of control. General negative ventilation and enclosure are also important control methods.

TABLE 90a—PAPER AND PULP MILLS—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Organic dusts	Dyes	Silicate dusts	Alkaline compounds	Salts	Carbon monoxide	Other gases	Other metals
Number of workers exposed.....	343	177	146	108	75	60	47	88
General positive ventilation.....	7.9	...	...	...	...	...	...	...
General negative ventilation.....	23.6	18.6	22.6	...	...	...	...	...
Local exhaust.....	8.7	...	...	5.8	...	76.7	4.3	...
Enclosure	14.0	15.3	18.5	...	...	...	...	...
Wet method.....	35.6	46.3	59.6	...	28.0	...	...	13.2
Respirator	6.1	...	...	1.9	...	...	...	...
Protective clothing.....	...	...	...	2.9	...	...	...	7.9
Other .....	...	...	...	...	...	...	...	42.1

Materials for which no control measures were indicated are as follows: Petroleum products (84), Mineral acids (69), Coal dust (bituminous) (56), Inks (23), Coal tar products (12), Silica dust (12), Lacquers and varnishes (12), Organic solvents (12), Dermatitis producers (9), Other chemicals (5), Non-silicious dusts (5), Lead and its compounds (3) and Benzol (3).

TABLE 91 — PAPER BOX FACTORIES — EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																							
	Dermatitis producers		Organic dusts		Inks	Petroleum products		Organic solvents		Alkaline compounds		Carbon monoxide	Other metals		Other gases	Lead and its compounds	Silicate dusts	Laquers and varnishes	Non-silicious dusts	Coal dust (bituminous)	Dyes	Benzol	Other chemicals	Paints and enamels
Total number of workers in plants surveyed, 1883	269	254	233	85	68	44	33	30	21	18	16	16	13	10	6	4	2	2						
Number of workers exposed.....	14.8	13.5	12.6	4.5	3.6	2.3	1.8	1.6	1.1	1.0	0.8	0.8	0.7	0.5	0.3	0.2	0.1	0.1						
Per cent of workers exposed.....																								
Assemblers.....	20	33	..	39	..	6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Box makers.....	19	18	..	4	..	..	4	..	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Coaters.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Corrugation men.....	26	32	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Coverers.....	18	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Cutters.....	..	49	..	..	..	..	..	7	..	..	..	..	3	..	..	..	..	..	..	..	..	..	..	..
Die makers.....	6	10	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Feeders.....	11	..	8	..	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Foremen.....	1	1	..	7	6	7	7	1	7	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..
Heaters.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Inspectors.....	6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Operators.....	68	66	22	4	3	8	5	..	4	..	..	..	..	1	6	..	..	..	..	..	..	..	..	..
Pasters.....	50	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Printers.....	2	2	199	1	51	3	..	..	..	14	..	16	..	..	..	..	..	..	..	..	..	..	..	..
Shippers.....	26	24	7	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Strippers.....	8	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Winders.....	2	..	..	..	..	20	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Other.....	6	4	1	29	5	..	..	22	6	2	16	..	8	..	..	..	..	..	..	..	..	2	2	..
Maintenance.....	..	13	1	..	..	..	17	..	..	..	..	..	6	9	..	..	..	..	..	..	..	2	..	..

Total number of workers in
plants surveyed, 1883

Paper Box Factories (Tables 91 and 91a)

The operations in this group consist primarily in the forming and gluing of paper and cardboard containers by machine methods. Organic dusts from the paper, dermatitis from the adhesive, and inks are the principal exposures. Local exhaust is the only important control method.

TABLE 91a—PAPER BOX FACTORIES—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Organic dusts	Petroleum products	Organic solvents	Carbon monoxide	Other metals	Other gases	Lead and its compounds	Lacquers and varnishes	Benzol	Paints and enamels
Number of workers exposed.....	254	85	68	83	80	21	18	16	4	2
General negative ventilation.....	17.7	...	1.5	...	...	...	33.3	...	...	...
Local exhaust.....	14.6	32.9	...	58.6	...	38.1	...	12.5	50.0	100
Respirator .....	...	...	...	...	...	...	...	12.5	...	100
Protective clothing.....	...	...	...	...	16.7	...	...	...	...	...

Materials for which no control measures were indicated are as follows: Dermatitis producers (269), Inks (238), Alkaline compounds (44), Silicate dusts (16), Nonsilicious dusts (13), Coal dust (bituminous) (10), Dyes (6), and Other chemicals (2).

Engraving and Photographic Work (Tables 92 and 92a)

Workers in this industry are exposed to many types of materials. Occupations where mineral acids, organic solvents, and benzol were specifically indicated were edited according to the indicated exposures. Substances such as chromates, coal tar products, salts, and many others, some of which were ordinarily classified under separate groups, were generally listed here under other chemicals, which constitutes the dominant exposure in the industry. Photographic technicians were charged with both other chemicals and dermatitis producers. It is noted that most occupations in this group are subjected to numerous exposures of varying types. General ventilation and local exhaust are again indicated as prevalent control measures. Protective clothing and enclosures constitute important methods of control for certain materials.

TABLE 92—ENGRAVING AND PHOTOGRAPHIC WORK—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																											
	Other chemicals	Other metals	Inks	Mineral acids	Organic solvents	Dermatitis producers	Benzol	Organic dusts	Petroleum products	Lead and its compounds	Alkaline compounds	Paints and enamels	Other gases	Chromium and its compounds	Carbon monoxide	Organic acids	Salts	Non-silicious dusts	Lacquers and varnishes	Alcohols, esters, and ethers	Cyanides	Silica dust	Silicate dusts	Dyes	Oils, fats, and waxes	Coal dust (bituminous)	Sulfur	
Total number of workers in plants surveyed, 645	160	104	101	97	87	82	68	64	41	40	33	31	30	21	17	16	14	12	11	10	8	8	8	8	7	1	1	
Number of workers exposed	24.8	16.1	15.7	15.0	13.5	12.7	10.5	6.4	6.2	5.1	4.8	4.7	3.3	2.6	2.5	2.5	2.2	1.9	1.7	1.6	1.2	1.2	1.2	1.2	1.1	0.2	0.2	
Percent of workers exposed	15.5	10.4	10.0	9.3	8.5	8.0	6.5	4.0	3.9	3.2	2.9	2.8	2.1	1.6	1.6	1.6	1.3	1.2	1.1	1.0	0.8	0.8	0.8	0.7	0.1	0.1		
Artists	2	2	26	...	3	6	1	...	...	...	...	30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Assemblers	...	...	...	...	...	15	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Battery men	...	2	...	2	...	...	...	14	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cutters	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Developers	14	12	...	17	...	...	...	2	2	2	2	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Engravers	14	16	...	26	...	...	...	2	2	2	26	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Etchers	38	16	2	42	39	...	38	...	6	6	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Finishers	3	10	...	1	2	3	...	...	...	4	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Floor walkers	...	...	4	...	2	...	...	2	4	4	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Operators	13	3	6	1	...	...	...	1	6	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Photographers	46	...	...	...	...	46	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Photo workers	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Platers	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Printers	26	16	38	6	35	1	12	4	11	9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Proofers	...	...	15	...	...	9	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Router	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Shippers	...	17	...	...	...	...	...	6	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Supervisors	1	1	1	2	1	1	...	6	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Wax casters	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Other	...	2	...	...	...	...	2	2	4	8	3	...	4	...	4	...	2	1	1	...	...	...	...	...	...	...	...
Maintenance	1	6	2	...	1	1	...	3	4	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

TABLE 93—PRINTING AND PUBLISHING—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation												
	Inks	Petroleum products	Organic solvents	Lead and its compounds	Other metals	Dermatitis producers	Other gases	Carbon monoxide	Organic dusts	Benzol	Halogenated hydrocarbons	Silicate dusts	Oils, fats, and waxes
Total number of workers in plants surveyed, 6472													
Number of workers exposed	1,826	1,384	1,086	881	562	484	360	356	232	205	195	123	106
Per cent of workers exposed	28.2	21.4	16.8	13.6	8.7	7.5	5.6	5.5	3.6	3.2	3.0	2.0	1.6
Assemblers .....	...	185	144	3	3	8	7	3	...	...	140	...	...
Binders	97	5	...	2	5	299	7	7	18	...	...	...	...
Case makers .....	...	...	...	...	...	11	2	2	...	...	...	...	...
Cleaners .....	...	...	5	...	...	...	3	3	...	...	...	...	1
Compositors	166	...	69	231	...	...	7	5	...	73	...	...	...
Cutters	37	7	...	2	36	...	1	1	37	...	...	...	...
Electrotypers .....	...	...	...	36	...	...	13	13	6	...	...	...	...
Engravers .....	...	...	11	4	1	2	...	...	2	11	...	...	...
Fly boys	40	39	39	...	...	...	...	...	...	...	...	...	...
Folders	8	4	3	...	...	...	4	4	...	...	...	...	...
Heat treaters .....	...	4	...	...	...	...	4	4	...	...	...	...	...
Ink mixers	13	11	11	...	11	...	...	...	...	...	...	...	11
Laborers	90	33	34	57	60	29	6	7	...	...	...	2	...
Linotype operators .....	...	...	...	17	...	...	7	7	...	...	...	...	...
Make up men	1	...	13	16	...	...	2	2	...	13	...	...	...
Melters .....	...	...	...	3	3	...	5	5	...	...	...	...	...
Operators	236	423	116	264	7	4	109	117	9	...	50	...	90
Oxidizers .....	...	3	...	3	3	...	...	...	3	...	...	...	...
Painters	3	...	...	2	...	...	...	...	...	...	...	...	...
Photographers .....	...	...	...	...	...	12	...	...	...	...	...	...	...
Photo lithographers	1	...	5	...	5	...	...	...	...	1	1	...	...
Platers .....	...	...	...	...	11	...	1	...	...	...	...	...	...
Plate molders .....	...	3	2	37	...	...	41	18	...	...	...	...	3
Polishers .....	...	2	...	...	37	...	...	...	14	...	...	23	...
Pressmen	675	533	534	16	138	31	47	23	...	9	...	...	...
Printers	162	8	23	49	...	30	30	31	...	98	...	...	...
Proofers	60	...	3	10	...	...	...	...	...	...	...	...	...
Shippers	164	6	3	7	101	47	...	...	123	...	3	...	...
Stereotypers .....	...	...	...	8	...	...	2	2	...	...	...	...	...
Supervisors	12	4	8	10	1	1	4	7	...	...	...	1	...
Technical men .....	...	...	...	...	...	5	...	...	...	...	...	...	...
Tool and die makers .....	...	35	...	...	56	...	...	...	...	...	...	54	...
Type setters	37	1	14	65	...	...	17	17	...	...	...	...	...
Washers .....	...	2	...	2	4	...	...	...	2	...	1	...	1
Other	13	...	5	7	4	2	6	6	10	...	...	...	...
Maintenance	16	71	44	30	76	3	35	72	8	...	...	48	...

TABLE 93.—PRINTING AND PUBLISHING—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

[illegible]

TABLE 98a — PRINTING AND PUBLISHING — PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Number of workers exposed																											
	Inks	Petroleum products	Organic solvents	Lead and its compounds	Other metals	Other gases	Carbon monoxide	Organic dusts	Benzol	Halogenated hydrocarbons	Silicate dusts	Oils, fats, and waxes	Non-silicious dusts	Mineral acids	Alkaline compounds	Lacquers and varnishes	Cyanides	Other chemicals	Paints and enamels	Salts	Fluorides	Cadmium and its compounds	Coal tar products	Chromium and its compounds	Alcohols, esters and ethers	Dyes	Antimony and its compounds	
General positive ventilation	1.1	...	0.8	2.8
General negative ventilation	1.3	8.6	2.5	6.7	7.3
Local exhaust	...	...	...	3.8	13.8	27.2	24.2	30.6	8.2	1.5	1.5	77.3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Enclosure	0.7	0.9	...	...	0.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Wet method	...	...	...	...	14.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Respirator	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Protective clothing	1.4	14.7	14.7	1.8	8.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Other	...	0.3	0.4	1.1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Materials for which no control measures were indicated are as follows: Dermatitis producers (484), Coal dust (bituminous) (24), Organic acids (17), Silica dust (15).

Printing and Publishing (Tables 93 and 93a)

All types of printing establishments, from small job presses to large publishing houses, are indicated in this sub-group. Engraving and photographic operations, which are usually a part of large publishing concerns, are included in this group. The establishments in the preceding sub-group were limited to the specific process of engraving and photographic procedures alone. The principal exposures in this group are inks, petroleum products, organic solvents, and lead. Only lead exposures were indicated in the use of type metal since antimony poisoning is not generally associated with the use of type metal. Local exhaust, protective clothing, and general negative ventilation are indicated as the principal control measures.

TEXTILES

Table 94 indicates the number and percentage of total exposures to the specified materials in each industrial sub-division of this group. It is apparent that organic dusts is the important exposure for the textile industry. The range of exposure for organic dusts in the various sub-groups is from 68.1% in the mattress and bedding to 11.5% in tents and awnings. This exposure is first in every group of the textile industry except the textile dyeing and finishing sub-group. An examination of the occupational tables for the various industries (Tables 95 and 95a) included under this major group, reveals that in only four of the eight sub-groups, namely, cotton goods, textile dyeing and finishing, woolen and worsted, and other textiles (including coated fabrics) is there any significant exposure to materials other than organic dusts. Control measures are notably absent and include principally local exhaust and general negative ventilation applied to a limited number of exposures.

TABLE 95.—COTTON GOODS—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																			
	Organic dusts	Petroleum products	Dyes	Inks	Oils, fats, and waxes	Other gases	Nonsilicious dusts	Sulfur	Silicate dusts	Carbon monoxide	Coal dust (bituminous)	Organic acids	Lacquers and varnishes	Alkaline compounds	Organic solvents	Other metals	Mineral acids	Aldehydes	Other chemicals	Lead and its compounds
Total number of workers in plants surveyed, 424																				
Number of workers exposed.....	236	43	39	28	26	21	12	10	10	9	7	5	5	4	3	3	2	2	2	1
Percent of workers exposed	56.7	10.1	9.2	6.6	6.1	5.0	2.8	2.4	2.4	2.1	1.7	1.2	1.2	0.9	0.7	0.7	0.5	0.5	0.5	0.2
Bleachers .....	..	..	..	..	..	4	..	..	..	..	..	4	..	2	..	..	..	..	2	2
Calendar men	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Cutters	9	..	..	..	..	..	..	..	..	..	..	..	..	1	..	1	2	2	..	..
Dyers .....	..	..	12	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Inspectors	7	..	2	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Mill men	11	10	..	..	..	..	10	10	10	..	..	..	..	..	..	..	..	..	..	..
Operators	124	24	24	9	24	18	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Printers	8	..	..	19	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Set up men	6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Shippers	10	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Shoppers	20	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Weavers	9	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Winders .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Other	16	..	1	..	..	..	..	..	..	..	..	1	5	1	3	..	..	..	..	1
Maintenance	11	9	..	..	..	4	2	..	..	9	7	..	..	..	..	2	..	..	..	..

TABLE 95a—COTTON GOODS—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Organic dusts	Dyes	Other gases	Non-silicious dusts	Sulfur	Silicate dusts	Carbon monoxide	Organic acids	Lacquers and varnishes	Alkaline compounds	Organic solvents	Other metals
Number of workers exposed	236	39	21	12	10	10	9	5	5	4	3	3
General negative ventilation ..	10.2	66.7	9.5	...	...	...	...	...	...	...	66.7	...
Local exhaust	0.4	...	...	...	...	...	77.8	...	100.0	...	...	...
Enclosure .....	...	2.6	19.0	...	...	...	...	60.0	100.0	100.0	66.7	33.3
Respirator	3.0	2.6	...	58.3	70.0	70.0	...	...	...	...	...	...
Protective clothing .....	...	2.6	...	...	...	...	...	...	...	25.0	...	100.0

Materials for which no control measures were indicated are as follows: Petroleum products (43), Inks (28), Oils, fats, and waxes (36), Coal dust (bituminous) (7), Mineral Acids (2), Aldehydes (2), Other chemicals (2), and Lead and its compounds (1).

TABLE 96—*KNIT GOODS—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation			
	Organic solvents	Petroleum products	Inks	Dyes
Total number of workers in plants surveyed, 1307				
Number of workers exposed	168	55	49	5
Percent of workers exposed	12.9	4.2	3.7	0.4
Adjusters .....	...	4	...	...
Cutters	60	...	...	...
Dyers .....	...	...	...	3
Finishers	4	...	47	...
Knitters	31	35	...	...
Laborers	3	...	...	...
Markers	6	...	...	...
Operators	37	...	...	...
Rippers	15	...	...	...
Shippers .....	...	...	2	...
Supervisors .....	...	1	...	2
Weavers .....	...	4	...	...
Winders	9	...	...	...
Maintenance	3	11	...	...

* The only control measure indicated is 2.4 percent general negative ventilation for organic dusts exposure.

TABLE 97.—TEXTILE DYEING AND FINISHING—EXPOSURE BY OCCUPATION TO SPECIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																			
	Dyes	Organic dusts	Organic acids	Alkaline compounds	Paints and enamels	Alcohols, esters, and ethers	Petroleum products	Mineral acids	Oils, fats, and waxes	Other gases	Halogenated hydrocarbons	Carbon monoxide	Coal dust (bituminous)	Other metals	Other chemicals	Inks	Lead and its compounds	Organic solvents	Silicate dusts	Salts
Total number of workers in plants surveyed, 687																				
Number of workers exposed	136	116	98	61	55	52	49	44	26	22	16	15	12	11	9	8	5	5	1	1
Percent of workers exposed	21.4	18.2	15.4	9.6	8.6	8.2	7.8	6.9	4.1	3.5	2.5	2.4	1.9	1.7	1.4	1.3	0.8	0.8	0.2	0.2
Brushers		32						2							9					
Chemists	13		4	4																
Coaters					27	27	1							1						
Color matchers					5	5														
Cutters		8																		
Examiners		8																		
Extruders																				
Kettle men	35		35	35			7	35						3						
Labors																				
Mixers				10	10	10			10											
Nappers		28																		
Operators	80	15	54				1		8	19		1								1
Painters				16																
Rain proofer	8								4									4		
Shearers		13												2		8				
Shippers							2													
Spanishers					6	6		5	6											
Supervisors	5	2	5	5																
Washers											16									
Winders							1							1						
Other		4				4		2	3	1										
Maintenance				1	7		87			2		14	12	4			5	1		1

TABLE 98.—WOOLEN AND WORSTED—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																			
	Organic dusts	Infections	Petroleum products	Oils, fats, and waxes	Alkaline compounds	Mineral acids	Carbon monoxide	Other metals	Salts	Dyes	Coal dust (bituminous)	Organic acids	Non-silicious dusts	Lead and its compounds	Chromium and its compounds	Silica dust	Organic solvents	Sulfur	Other gases	Paints and enamels
Total number of workers in plants surveyed, 2,302	416	126	78	52	47	39	37	33	28	27	25	23	18	13	10	4	4	4	2	2
Number of workers exposed.....	18.1	5.5	3.4	2.3	2.0	1.7	1.6	1.4	1.2	1.2	1.1	1.0	0.8	0.6	0.4	0.2	0.2	0.2	0.1	0.1
Percent of workers exposed	4.3	4.4	4.4	4.4	4.3	4.4	4.3	4.2	4.3	4.4	4.4	4.3	4.3	4.3	4.4	4.4	4.4	4.4	4.4	4.4
Carbonizers	14	..	..	..	14	14	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Carders	79	..	6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Drivers	14	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Dusters	6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Dyers .....	..	14	..	..	..	12	..	4	12	15	..	12	..	..	..	..	4	4	..	..
Finishers .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Floor men	7	..	..	..	11	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Inspectors	17	17	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Labors	10	12	30	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..
Mixers	6	1	6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Operators	47	7	..	24	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Pickers	6	7	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Sorters	99	51	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Spinners	21	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Strippers	8	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Supervisors	11	..	1	..	..	..	8	..	..	..	..	..	..	..	..	..	..	..	..	..
Trackmen	16	..	..	16	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Truckers	19	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Vat men	10	..	..	10	10	10	10	10	11	10	..	11	..	..	10	..	..	..	..	..
Washers	11	12	..	..	11	2	..	..	5	..	..	..	..	..	..	..	..	..	..	..
Other	7	..	..	1	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Maintenance	8	..	35	1	1	..	19	29	..	..	25	..	18	13	..	4	..	..	9	2

TABLE 97a—TEXTILE DYEING AND FINISHING—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Dyes	Organic dusts	Organic acids	Alkaline compounds	Mineral acids	Oils, fats, and waxes	Other gases	Halogenated hydrocarbons	Carbon monoxide	Other metals	Organic solvents	Salts
Number of workers exposed ..	136	116	98	61	44	26	22	16	15	11	5	1
General negative ventilation....	82.4	...	63.8	72.1	100.0	...	81.8	...	...	...	...	...
Local exhaust.....	22.1	6.9	30.6	50.8	68.2	3.8	4.5	...	86.7	...	20.0	...
Enclosure .....	...	...	...	...	...	...	100.0	...	...	...	...	100.0
Wet method .....	...	27.6	...	...	...	...	...	...	...	...	...	...
Protective clothing .....	...	...	...	...	...	...	...	...	18.2	...	...	...

Materials for which no control measures were indicated are as follows: Paints and enamels (55), Alcohols, esters, and ethers (52), Petroleum products (49), Coal dust (bituminous) (12), Other chemicals (9), Inks (8), Lead and its compounds (5), Silicate dusts (1).

TABLE 98a—WOOLEN AND WORSTED—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Organic dusts	Infections	Mineral acids	Carbon monoxide	Other metals
Number of workers exposed.....	416	126	39	37	33
Local exhaust	5.8	1.6	35.9	67.6	...
Enclosure	0.7	1.6	...	...	...
Protective clothing .....	...	...	...	...	6.1
Other .....	...	...	2.6	...	...

Materials for which no control measures were indicated are as follows: Petroleum products (78), Oils, fats, and waxes (52), Alkaline compounds (47), Salts (28), Dyes (27), Coal dust (bituminous) (25), Organic acids (23), Non silicious dusts (18), Lead and its compounds (13), Chromium and its compounds (16), Silica dust (4), Organic solvents (4), Sulfur (4), Other gases (2), and Paints and enamels (2).

TABLE 99—*EMBROIDERIES AND LACES—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation						
	Organic dusts	Other gases	Dyes	Organic solvents	Non-silicious dusts	Lead and its compounds	Other metals
Total number of workers in plants surveyed, 211							
Number of workers exposed.....	38	8	8	5	4	4	4
Percent of workers exposed.....	18.0	3.8	3.8	2.4	1.9	1.9	1.9
Bobbin makers .....	...	...	...	...	4	4	4
Cleaners	2	...	...	5	...	...	...
Cutters	2	...	...	...	...	...	...
Dyers .....	...	8	8	...	...	...	...
Operators	18	...	...	...	...	...	...
Strippers	1	...	...	...	...	...	...
Winders	15	...	...	...	...	...	...

* The only control measure indicated is 100 percent general negative ventilation for other gases exposure.

TABLE 100—TENTS AND AWNINGS—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation												
	Organic dusts	Paints and enamels	Lacquers and varnishes	Inks	Oils, fats, and waxes	Organic solvents	Non-silicious dusts	Other metals	Dyes	Dermatitis producers	Coal dust (bituminous)	Carbon monoxide	Lead and its compounds
Total number of workers in plants surveyed, 480													
Number of workers exposed.....	55	14	8	8	7	6	3	3	2	1	1	1	1
Percent of workers exposed.....	11.5	2.9	1.7	1.7	1.5	1.3	0.6	0.6	0.4	0.2	0.2	0.2	0.2
Assemblers .....	...	...	...	...	...	...	2	2	...	...	...	...	...
Cleaners	1	...	...	...	...	...	...	...	...	...	...	...	...
Cutters	13	...	...	...	...	...	...	...	...	...	...	...	...
Examiners	4	...	...	...	...	...	...	...	...	...	...	...	...
Foreladies	1	...	...	...	...	...	...	...	...	...	...	...	...
Frame makers .....	...	1	...	...	1	...	1	1	...	...	1	1	1
Laborers	2	...	...	...	...	...	...	...	...	...	...	...	...
Layout men	16	...	...	...	...	...	...	...	...	...	...	...	...
Operators	3	3	2	...	4	...	...	...	2	1	...	...	...
Painters .....	...	3	...	...	1	3	...	...	...	...	...	...	...
Pressmen	1	...	...	2	...	2	...	...	...	...	...	...	1
Router	2	...	...	...	...	...	...	...	...	...	...	...	...
Sewers	8	...	...	...	...	...	...	...	...	...	...	...	...
Shippers	4	7	6	6	1	1	...	...	...	...	...	...	...

TABLE 100a—TENTS AND AWNINGS—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Organic dusts	Paints and enamels	Non-silicious dusts	Other metals	Carbon monoxide
Number of workers exposed.....	55	14	3	3	1
Local exhaust .....	....	....	33.3	33.3	100.0
Enclosure	1.8	....	....	....	....
Protective clothing .....	....	35.7	....	....	....

Materials for which no control measures were indicated are as follows: Lacquers and varnishes (8), Inks (8), Oils, fats, and waxes (7), Organic solvents (6), Dyes (2), Dermatitis producers (1), Coal dust (bituminous) (1), Lead and its compounds (1), and Petroleum products (1).

TABLE 101—MATTRESSES AND BEDDING—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation												
	Organic dusts	Petroleum products	Paints and enamels	Lacquers and varnishes	Carbon monoxide	Other gases	Dyes	Non-silicious dusts	Other metals	Alkaline compounds	Dermatitis producers	Coal dust (bituminous)	Organic solvents
Total number of workers in plants surveyed, 524	357	9	6	5	5	4	4	4	4	2	2	1	1
Percent of workers exposed.....	68.1	1.7	1.1	1.0	1.0	0.8	0.8	0.8	0.8	0.4	0.4	0.2	0.2
Assemblers	17	..	..	..	..	..	..	..	..	..	..	..	..
Cutters	12	..	..	..	..	..	..	..	..	..	..	..	..
Finishers	20	..	..	2	..	..	2	..	..	..	..	..	..
Operators	106	..	2	..	..	..	..	..	..	..	..	..	..
Oven men	1	..	..	..	3	4	..	..	..	..	..	..	..
Pickers	13	..	..	..	..	..	..	..	..	..	..	..	..
Renovators	4	..	..	..	..	..	..	..	..	..	..	..	..
Rollers	7	..	..	..	..	..	..	..	..	..	..	..	1
Seamstresses	53	..	..	..	..	..	..	..	..	..	..	..	..
Shippers	16	..	..	..	..	..	..	..	..	2	..	..	..
Supervisors	9	..	..	..	..	..	..	..	..	..	..	..	..
Tick makers	43	..	..	..	..	..	..	..	..	..	2	..	..
Upholsterers	29	..	..	..	..	..	..	..	..	..	..	..	..
Other	3	4	..	8	1	..	2	..	..	..	..	..	..
Maintenance	4	5	4	..	1	..	..	4	4	..	..	1	..

TABLE 101a — MATTRESSES AND BEDDING — PERCENTAGE OF
EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES
FOR SPECIFIED MATERIALS

Control Measures	Organic dusts	Paints and enamels	Carbon monoxide	Other gases
Number of workers exposed.....	357	6	5	4
General positive ventilation.....	1.7	....	....	....
General negative ventilation.....	3.9	....	....	....
Local exhaust	7.6	66.7	80.0	75.0
Enclosure	0.6	....	20.0	25.0
Wet method	0.3	....	....	....
Respirator	0.3	33.3	....	....
Protective clothing .....	....	....	66.7	....
Other	0.6	....	....	....

Materials for which no control measures were indicated are as follows: Petroleum products (9), Lacquers and varnishes (5), Dyes (4), Non-silicious dusts (4), Other metals (4), Alkaline compounds (2), Dermatitis producers (2), Coal dust (bituminous) (1), and Organic solvents (1).

..TABLE 102—OTHER TEXTILE—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																											
	Organic dusts	Oils, fats, and waxes	Petroleum products	Dyes	Lacquers and varnishes	Alkaline compounds	Paints and enamels	Silicate dusts	Inks	Organic solvents	Carbon monoxide	Coal dust (bituminous)	Other gases	Dermatitis producers	Non-silicious dusts	Other metals	Alcohols, esters, and ethers	Mineral acids	Benzol	Other chemicals	Silica dust	Lead and its compounds	Organic acids	Chromium and its compounds	Salts	Coal tar products	Sulfur	
Total number of workers in plants surveyed, 2,122	316	210	141	121	98	83	72	66	59	59	52	41	33	14	10	9	8	7	7	6	4	4	3	3	2	1	1	1
Number of workers exposed..	38.5	9.9	6.6	5.7	4.6	3.9	3.4	3.1	2.8	2.8	2.5	1.9	1.6	0.7	0.5	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.0	0.0	0.0
Percent of workers exposed..	38.5	9.9	6.6	5.7	4.6	3.9	3.4	3.1	2.8	2.8	2.5	1.9	1.6	0.7	0.5	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.1	0.1	0.1	0.0	0.0	0.0
Cleaners	2					8							2															
Coaters	8	83		40	35		8	8		40			8															
Compounders	2	2	2				2	2					2															
Cookers		12											12															
Cutters	117								1																			
Dyers				8							1		1										2					
Grainers					6																							
Grinders				20			20																					
Inspectors	11				25																							
Laborers	137	17	17		2	17	4				14	10	4					4										
Mixers	1	50			30		20	30																				
Operators	345	88	100	10		50	15	15	16					3			1											
Other cloth workers..	21																											
Pickers	12																											
Pounders	8																											
Printers				40					2	2																		
Fullers		5		5							3		3									2						
Rollers																												
Sewers	44		2																									
Shippers	21					7			56					4														
Sorters	8																											
Stuffers	33																											
Supervisors	10	1	1	2		1	1	1			21	20	1				1	1	1	1	3		1		3	1	1	1
Other	9						2	4			2																	
Maintenance	27	2	10	1				7		1	11	11		4		9	1	2	1		4	2						

TABLE 102a—OTHER TEXTILES—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Control Measures																Sulfur			
	Organic dusts	Oils, fats, and waxes	Dyes	Lacquers and varnishes	Alkaline compounds	Paints and enamels	Silicate dusts	Organic solvents	Carbon monoxide	Other gases	Non-silicious dusts	Other chemicals	Organic acids	Chromium and its compounds	Coal tar products	Sulfur				
Number of workers exposed.....	816	210	121	98	83	72	66	59	52	33	10	6	3	3	1	1				
General negative ventilation.....	13.5	..	0.8	39.6	1.2	..	68.2	93.2	..	36.4	..	50.0	33.3	100.0	100.0	100.0				
Local exhaust	3.1	..	2.5	35.7	1.2	2.8	..	93.2	78.8	42.4	80.0	50.0	100.0	100.0	100.0	100.0				
Gas mask .....	..	..	..	..	..	..	..	67.8	..	..	..	..	..	..	..	..
Respirator	0.1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Protective clothing.....	5.6	51.0	82.6	35.7	2.4	55.6	..	..	..	..	..	..	..	..	..	..

Materials for which no control measures were indicated are as follows: Petroleum products (141), Inks (59), Coal dust (bituminous) (41), Dermatitis producers (14), Other metals (9), Alcohols, esters, and ethers (8), Mineral acids (7), Benzol (7), Silica dust (4), Lead and its compounds (4), Salts (2).

RUBBER

The rubber industry, usually included under miscellaneous manufacturing industries for the purpose of industrial hygiene studies, was placed in a separate major classification in Ohio's survey. According to the 1930 census (Table 2), 60,871 workers were employed in the rubber factories of Ohio, putting this industry third in employment among the 13 major industrial groups. Ohio industries manufacture practically every type of known rubber product. The materials used in their manufacture include hundreds of ingredients ranging from harmless substances to chemicals of the highest order of toxicity. For systematic consideration, the compounding ingredients may be conveniently classified into the following groups: raw rubber, reclaimed rubber, vulcanizing agents, accelerators, antioxidants, plasticizers and softeners, stiffeners, fillers, pigments and coloring agents, rubber substitutes, odorants, blowing agents for sponging, and abrasives. In addition to these ingredients, which are concerned only with rubber compounding, other substances such as solvents in rubber cements and talc dust to prevent adhesion, are encountered in the manufacture of rubber products.

Table 103 indicates the percentage of total exposures to the specified materials in the two sub-divisions of this group. Rubber tires show more exposures to practically all of the material groups, but this is due to the larger number of employes in this group as compared with the sub-group,

TABLE 103—RUBBER—EXPOSURE TO SPECIFIED MATERIALS

Materials	Number of workers exposed to specified materials	Number and Percentage of Total Exposures to the Specified Materials in Each Industrial Subdivision			
		Rubber tires		Other rubber factories	
		No.	%	No.	%
Silicate dusts	3,751	3,085	82.2	666	17.8
Organic solvents	3,478	3,022	86.9	456	13.1
Organic dusts	2,932	2,408	82.0	529	18.0
Other metals	2,038	1,799	88.3	239	11.7
Non-silicious dusts	1,580	1,343	85.3	232	14.7
Petroleum products	1,324	1,203	90.9	121	9.1
Alkaline compounds	1,230	946	76.9	284	23.1
Sulfur	1,141	919	80.5	222	19.5
Accelerators	1,091	942	86.3	149	13.7
Lead and its compounds	1,015	957	94.6	58	5.4
Oils, fats and waxes	751	675	89.9	76	10.1
Other gases	630	444	70.5	186	29.5
Antimony and its compounds	548	539	98.4	9	1.6
Carbon monoxide	446	329	73.8	117	26.2
Benzol	392	383	97.7	9	2.3
Inks	368	89	24.2	279	75.8
Halogenated hydrocarbons	279	276	99.3	3	1.1
Dermatitis producers	268	171	63.8	97	36.2
Mineral acids	231	223	96.5	8	3.5
Alcohols, esters and ethers	218	8	3.7	210	96.3
Paints and enamels	216	156	71.8	61	28.2
Dyes	179	23	12.8	156	87.2
Other chemicals	163	157	96.3	6	3.7
Coal dust (bituminous)	155	103	66.5	52	33.5
Lacquers and varnishes	126	61	48.4	65	51.6
Organic acids	105	64	61.0	41	39.0
Silica dust	65	42	64.6	23	35.4
Hydrogen sulfide	57	53	93.0	4	7.0
Salts	38	...	...	38	100.0
Cyanides	23	3	13.0	20	87.0
Coal tar products	19	11	57.9	8	42.1
Asbestos dusts	17	4	23.5	13	76.5
Mercury and its compounds	3	3	100.0	...	...
Chromium and its compounds	2	...	...	2	100.0

TABLE 104—RUBBER TIRES—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation													
	Silicate dusts	Organic solvents	Organic dusts	Other metals	Non-silicious dusts	Petroleum products	Lead and its compounds	Alkaline compounds	Accelerators	Sulfur	Oils, fats, and waxes	Antimony and its compounds	Other gases	Benzol
Total number of workers in plants surveyed, 15,828														
Number of workers exposed	3,085	3,022	2,403	1,799	1,348	1,203	957	946	942	919	675	539	444	383
Per cent of workers exposed	20.1	19.7	15.7	11.7	8.8	7.8	6.2	6.2	6.1	6.0	4.4	3.5	2.9	2.5
Assemblers	8	...	19	...	...	...	...	...	...	...	...	...	...	...
Baggers	59	...	19	...	...	...	...	...	...	...	...	...	...	4
Balancers	73	...	...	...	...	...	...	...	...	...	...	...	16	...
Bead makers .....	...	...	36	...	...	36	...	...	...	...	...	...	...	...
Buffers	3	118	12	69	...	...	...	...	...	...	...	...	...	12
Builders	354	1,517	240	60	...	44	11	...	...	...	...	...	13	135
Cementers .....	...	50	2	...	...	...	...	...	...	...	...	...	...	5
Cleaners	45	74	46	27	...	11	15	19	...	...	23	...	34	...
Compounders	193	...	200	201	197	...	120	183	201	189	47	117	...	...
Curing men	130	13	21	5	...	...	3	42	3	...	...	...	8	13
Cutters	24	115	29	...	...	...	3	...	1	...	...	...	...	...
Finishers .....	...	62	...	63	63	...	...	4	...	...	4	...	...	...
Grinders	15	...	15	14	17	...	...	...	...	...	...	...	...	...
Heaters	239	...	146	...	...	3	...	...	...	...	...	...	3	...
Inspectors	45	48	4	...	4	...	...	...	...	...	...	...	...	17
Laborers	246	27	33	...	...	57	19	...	3	...	...	...	6	...
Liners	25	4	18	...	...	...	...	...	...	...	...	...	...	...
Machinists	21	...	...	311	289	359	...	...	...	...	...	...	...	3
Mill men	648	122	670	536	504	4	415	451	529	495	414	382	84	4
Mixers	76	87	24	87	24	50	11	21	27	33	80	12	49	87
Operators	161	42	87	59	44	21	23	18	55	75	57	10	...	25
Pattern makers .....	...	22	...	6	...	...	...	...	...	...	...	...	...	...
Preparers	53	128	18	...	...	...	11	...	...	...	...	...	...	...
Pressmen	38	...	...	4	...	39	5	45	...	...	...	...	...	...
Printers .....	...	24	...	...	...	...	6	...	...	...	...	...	...	...
Production men .....	...	161	...	...	...	...	...	...	...	...	...	...	...	...
Sand blasters .....	...	...	...	9	3	...	...	...	...	...	...	...	...	...
Scrap men .....	...	...	18	...	...	...	...	18	...	...	...	...	...	...
Shippers	19	18	92	48	48	16	4	68	48	59	42	4	...	15
Spicers	49	27	...	...	...	...	...	...	...	...	...	...	...	9
Spreaders	18	37	...	...	...	...	...	...	...	...	...	...	...	87
Supervisors	17	36	33	19	14	7	17	14	16	16	10	14	...	11
Technical men .....	...	4	...	3	...	...	...	...	6	...	...	...	...	...
Truckers	32	11	24	24	23	...	21	23	22	22	24	...	1	...
Weighers	22	...	26	21	21	...	6	20	3	31	31	24	...	...
Other	136	32	32	11	...	9	34	15	...	...	...	...	66	7
Maintenance	412	307	449	249	19	514	179	22	...	1	...	...	152	2

TABLE 104a—RUBBER TIRES—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures														
	Silicate dusts	Organic solvents	Organic dusts	Other metals	Non-silicious dusts	Petroleum products	Lead and its compounds	Alkaline compounds	Accelerators	Sulfur				
Number of workers exposed.....	3,085	3,022	2,403	1,799	1,349	1,203	957	946	942	919				
General positive ventilation.....	7.7	4.8	11.3	2.2	2.1	...	...	...	...	8.9	8.0			
General negative ventilation.....	52.5	25.8	60.3	48.0	52.2	4.4	54.3	76.0	67.4	74.4				
Local exhaust	24.3	7.4	37.4	55.8	49.3	6.1	56.6	59.5	56.7	67.6				
Enclosure	2.4	4.9	1.5	5.2	0.7	6.1	2.1	4.1	3.3	2.9				
Wet method	0.8	...	...	...	...	...	...	...	...	...
Gas mask .....	...	1.2	0.5	...	...	...	...	...	...	...
Respirator	0.6	...	0.4	0.9	4.9	...	2.0	0.3	1.2	...				
Protective clothing	0.1	1.2	1.5	5.2	2.1	0.2	...	2.7	4.2	3.4				

TABLE 104—RUBBER TIRES—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Number of workers exposed to specified materials by occupation																			
Carbon monoxide	Halogenated hydrocarbons	Mineral acids	Dermatitis producers	Other chemicals	Paints and enamels	Coal dust (bituminous)	Organic acids	Lacquers and varnishes	Hydrogen sulfide	Silica dust	Inks	Dyes	Coal tar products	Alcohols, esters and ethers	Asbestos dusts	Cyanides	Mercury and its compounds		
329	276	223	171	157	155	103	64	61	53	42	39	28	11	8	4	3	3		
2.1	1.8	1.5	1.1	1.0	1.0	0.7	0.4	0.4	0.3	0.3	0.3	0.2	0.1	0.1	0.0	0.0	0.0		
...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	10	...	16	...	...	...	...	...	...	...	...	...	...	...	...
...	...	36	...	...	...	...	...	...	...	22	...	...	...	...	...	...	...
...	104	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	...
...	34	29	...	...	29	...	...	...	...	5	...	...	...	...	...	...	...
...	8	...	...	...	3	5	...	6	...	...	...	...	...	...	...	...	...
...	...	...	...	...	35	...	...	...	...	...	2	...	...	...	...	...	...
...	...	...	...	...	2	...	...	4	...	...	...	...	...	...	...	...	...
...	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	2	...	...	...	3	17	...	...	17	...	...	...	...	...	...	...	...
...	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	4	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	49	24	8	...	...	...	13	...	4	...	...	...	3	...	...	...	...
...	5	...	33	11	...	43	...	...	49	...	...	...	...	11	...	...	...
...	...	...	22	...	...	...	...	22	...	4	8	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	6	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	14	20	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	5	...	...	...	...	...	...	...
...	1	...	95	...	...	...	...	...	...	...	7	...	...	3	...	...	...
...	...	24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	1	...	...	...	...	...	...	...	1	5	...	...	...	...	...
...	...	...	143	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	1	...	...	1	...	...	...	...	...	...	...	...	...	...
...		
...	53	46	...	...	...	6	...	...	...	...	1	...	...	5	...	3	...		
...	218	90	1	...	52	92	...	18	...	6	...	...	...	...	...	...	3	...	3

TABLE 104a—RUBBER TIRES—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Oils, fats, and waxes	Antimony and its compounds	Other gases	Benzol	Carbon monoxide	Halogenated hydrocarbons	Mineral acids	Other chemicals	Paints and enamels	Coal dust (bituminous)	Organic acids	Lacquers and varnishes	Hydrogen sulfide	Silica dust	Dyes	Coal tar products	Asbestos dusts	Cyanides
675	539	444	383	329	276	223	157	155	103	64	61	53	42	28	11	4	3
...	...	...	53.3	...	...	...	5.7	...	...	43.7	...	...	...	...	...	...	...
65.8	92.0	20.0	81.7	25.8	100.0	22.4	5.7	85.8	39.8	92.2	...	100.0	23.8	28.6	...	100.0	...
54.8	92.0	28.1	28.7	37.7	19.2	36.3	12.7	5.8	...	43.7	29.5	100.0	80.9	28.6	27.3	...	100.0
3.2	3.3	20.0	29.2	3.3	19.2	28.2	7.0	...	...	...	...	100.0	4.8	...	27.3	...	100.0
...
...	...	...	9.1	...	...	10.8	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	7.0	14.8	...	...	...	...	14.3	...	27.3	...	...
...
7.0	...	1.8	...	...	...	11.6	5.7	5.8	...	48.4	14.7	...	...	...	...	...	100.0

Materials for which no control measures were indicated are as follows: Dermatitis producers (171), Inks (39), Alcohols, esters, and ethers (8), and Mercury and its compounds (3).

TABLE 105—OTHER RUBBER FACTORIES—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation														
	Silicate dusts	Organic dusts	Organic solvents	Inks	Alkaline compounds	Other metals	Non-silicious dusts	Sulfur	Alcohols, esters, and ethers	Other gases	Dyes	Accelerators	Petroleum products	Carbon monoxide	Dermatitis producers
Total number of workers in plants surveyed, 2,716															
Number of workers exposed.	666	529	456	319	284	239	232	222	210	186	151	149	121	117	97
Percent of workers exposed.	24.5	19.6	16.8	11.7	10.5	8.7	8.5	8.2	7.7	6.8	5.6	5.5	4.5	4.3	3.6
Assemblers	1	3	77	11	11	...	...	...	...	16	13	...	...	...	23
Buffers	12	8	...	...	...	...	...	...	...	...	...	...	...	...	...
Compounders	10	22	1	...	7	30	27	34	...	9	15	33	2	...	...
Coverers	...	...	...	...	12	...	...	...	...	...	...	...	...	...	...
Curing men	7	3	6	...	4	1	...	1	...	...	...	2	...	...	...
Cutters	20	32	19	...	1	4	1	1	...	...	...	1	...	...	...
Decorators	...	...	33	3	...	...	...	...	...	...	...	...	...	...	...
Developers	3	3	...	...	3	3	3	3	...	...	...	3	...	...	...
Dippers	...	2	35	...	...	1	1	1	...	19	...	1	...	3	...
Engravers	...	...	15	15	...	...	...	...	...	...	...	...	15	...	...
Fillers	...	...	3	...	...	...	...	...	...	12	...	...	...	...	...
Finishers	...	97	...	...	...	...	3	...	...	...	...	...	...	...	...
Forming girls	1	4	4	...	5	...	...	...	...	4	...	...	...	...	...
Grinders	...	23	...	...	...	...	19	3	...	...	...	...	...	...	...
Inspectors	229	5	6	206	2	...	...	...	205	...	...	...	...	...	1
Laborers	3	3	6	...	...	...	...	...	...	...	...	...	...	...	...
Machinists	26	20	...	...	...	19	39	...	...	9	...	...	15	29	...
Mill men	39	60	1	...	26	56	61	65	...	18	26	54	7	8	...
Mixers	14	16	20	...	12	15	15	12	...	1	3	12	2	1	...
Molders	20	20	41	...	20	20	3	20	...	...	20	...	...	8	...
Operators	82	63	6	...	80	47	44	58	...	41	3	36	7	...	...
Platers	...	1	5	...	8	1	...	...	...	...	...	...	...	...	...
Pressmen	17	5	...	...	64	2	2	2	...	11	...	2	11	...	...
Printers	...	...	65	20	...	...	2	...	...	...	45	...	...	...	...
Refiners	15	15	...	...	...	15	...	15	...	...	...	...	...	...	...
Rollers	...	4	4	6	...	...	...	...	...	5	...	...	...	...	...
Shippers	7	31	17	56	10	7	5	7	...	...	4	3	...	...	22
Stampers	...	10	32	1	...	...	...	...	...	...	14	...	...	...	...
Stamp makers	8	10	...	...	...	...	...	...	...	10	...	...	...	...	...
Strippers	59	2	4	...	...	...	...	...	1	...	...	...	...	...	...
Supervisors	1	5	1	...	...	...	1	...	...	1	...	...	...	1	...
Technical men	16	...	...	...	...	...	...	...	...	2	...	...	...	...	2
Trimmers	16	10	19	...	13	...	...	...	...	...	...	...	...	...	...
Truckers	2	...	...	...	...	...	...	...	...	2	...	...	2	2	...
Vulcanizers	11	11	1	...	...	...	...	...	...	...	...	...	...	...	40
Washers	9	6	3	...	1	...	...	...	2	...	...	...	...	...	...
Other	35	20	30	...	3	2	6	...	2	14	8	2	...	12	2
Maintenance	3	15	2	1	2	16	...	...	...	12	...	...	60	53	7

other rubber factories. The two sub-groups, rubber tires and other rubber factories, differ primarily in the type of product manufactured, the raw materials and ingredients used being similar in both groups.

Rubber Tires (Tables 104 and 104a)

The principal exposures in the rubber tire industry are silicate dusts, organic solvents, organic dusts, and other metals. Although the incidence of exposure to the above materials is high, the dangerous properties of materials such as lead, accelerators, antimony, benzol, and halogenated hydrocarbons must not be overlooked. It is noted that the occupations, mill men, mixers, and compounders, show exposures to a variety of materials. In the editing procedure, exposures to the large number of materials which make up the compounded rubber stock were indicated only

TABLE 105—OTHER RUBBER FACTORIES—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

[illegible]

through the mixing, compounding, and milling operations, and were not indicated in the tire building and curing operations. A large part of the materials was controlled in part by general negative ventilation, local exhaust, enclosures, and protective clothing. Respirators are also an important method of control in certain selected exposures.

Other Rubber Factories (Tables 105 and 105a)

The materials encountered in this group are similar in type to those already discussed under rubber tires except that the order of their prevalence has changed in certain cases. Outstanding occupations are compounders, mill men, mixers, operators, molders, and inspectors. Nearly all of the exposures are controlled in part by general negative ventilation, local exhaust, and enclosure, with respirators and protective clothing applying to certain exposures.

TABLE 105a—OTHER RUBBER FACTORIES—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

[illegible]

Materials for which no control measures were indicated are as follows: Alcohols, esters and ethers (210), Petroleum products (121), Salts (38), Antimony and its compounds (9), Coal tar products (8), Other chemicals (6) and Halogenated hydrocarbons (3).

TABLE 106— MISCELLANEOUS MANUFACTURING— EXPOSURE TO SPECIFIED MATERIALS

Materials	Number of workers exposed to specified materials			Brooms and brushes			Electrical machinery			Instruments			Gas and electrical fixtures			Storage batteries			Dental supplies			Optical goods			Signs (non-electrical)			Toys and unclassified novelties			Other manufacturing plants		
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%			
Other metals	7,670	9	0.1	5,872	76.6	128	1.7	796	9.5	356	4.6	98	1.3	8	0.1	15	0.2	127	1.7	331	4.3												
Other gases	5,454	1	0.0	2,968	54.4	42	0.8	1,461	26.8	696	12.8	102	1.9	20	0.4	33	0.5	23	0.4	108	2.0												
Petroleum products	5,146	14	0.3	3,766	73.2	86	1.7	398	6.4	479	9.3	40	0.8	25	0.5	17	0.3	29	0.6	362	7.0												
Carbon monoxide	4,770	3	0.1	2,582	54.1	44	0.9	1,297	25.7	639	13.2	102	2.1	22	0.5	29	0.5	22	0.5	110	2.3												
Lead and its compounds	2,682	3	0.1	1,681	63.4	16	0.6	1,069	15.4	650	24.5	1	0.0	4	0.2	23	0.9	2	0.1	108	3.3												
Organic dusts	2,267	129	5.7	1,723	81.9	5	0.2	330	15.4	147	6.5	82	3.7	110	4.9	13	0.6	110	4.9	372	16.4												
Silicate dusts	2,246	12	0.5	1,321	58.8	22	1.0	339	15.1	147	6.5	82	3.7	110	4.9	13	0.6	110	4.9	372	16.4												
Non-silicious dusts	1,723	4	0.2	954	55.4	93	5.4	59	3.4	37	3.0	69	5.6	75	4.4	13	0.8	96	5.6	326	13.9												
Silica dust	1,292	17	1.4	758	61.5	2	0.2	53	4.3	37	3.0	69	5.6	75	4.4	13	0.8	96	5.6	326	13.9												
Mineral acids	1,049	25	2.4	557	53.1	3	0.3	87	8.3	231	22.0	71	6.8	...	...	...	...	109	8.8	162	18.1										
Oils, fats and waxes	1,000	1	0.1	818	81.8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Alkaline compounds	990	...	...	924	93.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Laquers and varnishes	966	35	3.7	564	59.0	7	0.7	145	15.2	22	2.3	10	1.0	...	...	...	...	...	...	...						
Paints and enamels	795	3	0.4	516	64.9	15	1.9	36	4.5	32	4.0	1	0.1	...	...	...	...	...	...	...						
Organic solvents	793	...	...	278	35.1	4	0.5	53	6.7	185	23.5	41	5.2	1	0.1	34	4.3	10	1.3	186	23.5										
Benzol	773	...	...	768	99.4	3	0.4	...	...	2	0.2	...	...	...	...	...	...	...	...	...	...		
Coal tar products	532	...	...	344	64.7	2	0.4	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Antimony and its compounds	478	...	...	313	65.5	...	...	...	...	152	31.6	47	8.8	...	...	...	...	...	...	...	...				
Laqueris producers	386	...	...	219	56.7	...	...	15	3.9	1	0.3	...	...	...	...	...	...	...	...	...	...		
Ratogenated hydrocarbons	327	...	...	283	86.5	...	...	...	...	2	0.6	41	12.5	...	...	...	...	...	...	...	...				
Alcohols, esters and ethers	310	...	...	94	30.3	3	1.0	165	53.2	3	1.0	34	11.0	...	...	...	...	...	...	...	...				
Coal dust (bituminous)	245	2	0.8	120	49.0	...	...	61	24.9	27	11.0	...	...	...	...	...	...	...	...	...	...		
Core gases	239	...	...	239	100.0	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Inks	225	3	1.3	48	21.3	3	1.3	3	1.3	9	4.0	...	...	...	...	...	...	...	...	...	...		
Chromium and its compounds	221	...	...	169	76.5	...	...	12	5.4	12	5.4	...	...	...	...	...	...	...	...	...	...		
Other chemicals	211	...	...	16	7.6	4	1.9	150	71.1	30	14.2	9	4.3	...	...	...	...	...	...	...	...				
Temperature change	188	...	...	186	96.4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Salts	185	...	...	77	41.6	...	...	25	13.5	62	33.5	...	...	...	...	...	...	...	...	...	...		
Asbestos dusts	168	...	...	96	57.8	...	...	...	...	1	0.6	...	...	...	...	...	...	...	...	...	...		
Sulfur dioxide	168	48	29.4	110	67.5	3	1.8	...	...	2	1.2	...	...	...	...	...	...	...	...	...	...		
Cyanides	116	...	...	75	64.7	...	...	22	19.0	12	10.3	...	...	...	...	...	...	...	...	...	...		
Mercury and its compounds	104	...	...	41	39.4	21	20.2	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Organic acids	67	25	37.3	3	4.5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Cadmium and its compounds	65	...	...	48	73.8	...	...	10	15.4	2	3.0	37	55.2	...	...	...	...	...	...	...	...				
Manganese and its compounds	62	21	33.9	32	51.6	...	...	33	53.2	29	46.8	...	...	...	...	...	...	...	...	...	...		
Sulfur	55	44	80.0	...	...	...	...	2	3.6	...	...	...	...	...	...	...	...	...	...	...	...
Dyes	32	...	...	18	56.3	...	...	13	40.6	...	...	...	...	...	...	...	...	...	...	...	...
Fluorides	31	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Aldehydes	13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Phosphorus and compounds	13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Arsenic and its compounds	10	...	...	...	...	...	...	10	100.0	...	...	...	...	...	...	...	...	...	...	...	...
Accelerators	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

TABLE 107—BROOMS AND BRUSHES—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																		
	Organic dusts	Sulfur dioxide	Dyes	Lacquers and varnishes	Organic acids	Mineral acids	Sulfur	Silica dust	Petroleum products	Silicate dusts	Other metals	Non-silicious dusts	Carbon monoxide	Inks	Lead and its compounds	Paints and enamels	Coal dust (bituminous)	Other gases	Oils, fats, and waxes
Total number of workers in plants surveyed, 430																			
Number of workers exposed.....	129	43	44	35	25	25	21	17	14	12	9	4	3	3	3	3	2	1	1
Percent of workers exposed.....	30.0	11.2	10.2	8.1	5.8	5.8	4.9	4.0	3.3	2.8	2.1	0.9	0.7	0.7	0.7	0.7	0.5	0.2	0.2
Bleachers .....	..	3	..	..	..	..	3	..	..	..	..	..	1	..	..	..	..	..	..
Branders	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..
Broom and brush makers.....	17	3	3	5	5	5	5	..	..	..	..	..	..	..	3	3	..	..	..
Cutters	3	2	..	..	..	..	..	..	4	..	..	..	..	..	..	..	..	..	..
Finishers	5	..	1	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Inspectors	9	3	2	2	3	3	..	..	..	..	..	..	..	..	..	..	..	..	..
Laborers	3	6	7	7	6	6	..	..	..	..	..	1	..	..	..	..	..	..	..
Operators	37	..	..	..	..	..	..	..	3	..	3	3	..	3	..	..	..	..	..
Painters .....	..	..	4	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Sanders .....	..	..	..	..	..	..	..	3	..	..	..	..	..	..	..	..	..	..	..
Scrapers	7	5	3	3	3	3	2	2	..	2	..	..	..	..	..	..	..	..	..
Sewers	5	2	2	3	2	2	..	..	..	..	..	..	..	..	..	..	..	..	..
Sorters	12	17	13	9	6	6	11	4	..	4	..	..	..	..	..	..	..	..	..
Trimmers .....	..	..	..	..	..	..	..	..	..	2	2	..	..	..	..	..	..	..	..
Other	11	3	..	..	..	..	..	1	1	4	4	..	..	..	..	..	..	..	1
Maintenance	16	..	..	..	..	..	..	7	6	4	..	..	2	..	..	..	..	..	..

TABLE 107a—BROOMS AND BRUSHES—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Organic dusts	Sulfur dioxide	Dyes	Sulfur	Silica dust	Silicate dusts	Non-silicious dusts	Carbon monoxide
Number of workers exposed.....	129	48	44	21	17	12	4	3
Local exhaust	23.2	6.2	....	....	94.1	50.0	25.0	66.7
Enclosure	0.8	4.2	....	4.8	5.9	8.3	....	....
Protective clothing .....	....	....	4.5	....	....	....	....	....

Materials for which no control measures were indicated are as follows: Lacquers and varnishes (85), Organic acids (25), Mineral acids (25), Petroleum products (14), Other metals (9), Inks (3), Lead and its compounds (3), Paints and enamels (3), Coal dust (bituminous) (2), Other gases (1), and Oils, fats and waxes (1).

OTHER MISCELLANEOUS MANUFACTURING

Table 106 indicates the percentage of total exposures for each subdivision in this major group. The individual minor industrial groups in this major classification bear practically no relation to each other in so far as types of exposures and occupations are concerned. Therefore, each minor group is considered individually.

Brooms and Brushes (Tables 107 and 107a)

The principal exposures are organic dusts, sulfur dioxide, and dyes. The principal control methods, applied to a limited number of exposures, are local exhaust and enclosures.

Electrical Machinery (Tables 108 and 108a)

The importance of this group is indicated both by the large number of workers employed and the variety of exposures encountered. Typical products represented under electrical machinery are refrigerators, electric motors, household appliances, and radios. The principal exposures are other metals, petroleum products, other gases, carbon monoxide, and lead. Certain minor exposures, as represented by a relatively small percentage of exposed workers, should not be overlooked. Although the percentage exposure to these materials is small, the actual number of workers concerned is large due to the large total number of workers employed in electrical industries. For example, there are 768 exposures to benzol, 344 to coal tar products, 313 to antimony, 283 to halogenated hydrocarbons, etc. Some occupations indicated are of a non-specific type such as assemblers, operators, and repairmen. Others such as painters, platers, solderers, and welders, indicate clearly the type of work being done. All types of control measures are represented in this group, and all but four of the material groups are represented with some type of control.

TABLE 108—ELECTRICAL MACHINERY—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation															
	Other metals	Petroleum products	Other gases	Carbon monoxide	Lead and its compounds	Silicate dusts	Non-silicious dusts	Oils, fats, and waxes	Benzol	Silica dust	Organic dusts	Alkaline compounds	Lacquers and varnishes	Mineral acids	Paints and enamels	Coal tar products
Total number of workers in plants surveyed, 25,342.	5,872	3,766	2,968	2,582	1,681	1,321	954	818	768	758	723	624	564	557	516	344
Number of workers exposed	23.2	14.9	11.7	10.2	6.6	5.2	3.8	3.2	3.0	3.0	2.9	2.5	2.2	2.2	2.0	1.4
Per cent of workers exposed	23.2	14.9	11.7	10.2	6.6	5.2	3.8	3.2	3.0	3.0	2.9	2.5	2.2	2.2	2.0	1.4
Assemblers	1,190	224	712	261	1,023	74	66	477	400	1	52	14	19	29	4	24
Casters	56	14	58	50	...	...	5	...	...	...	...	...	...	...	...	24
Chargers .....	...	5	18	6	...	...	...	...	...	...	...	...	...	...	...	...
Cleaners .....	...	13	8	4	...	10	...	8	3	...	...	50	...	2	6	...
Cutters	2	20	7	...	1	...	...	...	...	...	11	...	...	...	...	...
Electricians	41	32	9	9	39	...	6	2	...	7	...	...	...	...	...	...
Finishers	113	19	1	...	4	117	5	...	...	4	8	...	6	2	4	...
Foundry workers	219	12	59	59	2	252	...	...	...	257	6	...	...	...	...	...
Furnace tenders	22	3	7	16	...	8	...	...	...	...	...	...	2	...	2	...
Grinders	428	254	...	...	...	163	34	...	...	47	2	15	...	...	...	...
Handlers .....	...	...	...	...	...	19	...	...	...	...	...	...	...	...	...	...
Heat treaters	13	23	51	36	...	...	...	3	...	...	...	21	...	...	...	...
Inspectors	10	...	1	...	10	...	...	290	290	...	...	...	...	...	10	...
Insulators	2	27	27	27	...	...	...	...	...	...	...	...	...	...	...	...
Laborers	24	53	36	46	15	6	...	2	...	...	29	...	16	...	5	...
Machinists	619	775	111	114	11	167	242	12	...	14	14	4	...	...	...	6
Metal workers	82	...	76	68	30	47	2	...	...	2	...	...	...	24	1	...
Mixers .....	...	2	7	6	...	...	...	...	...	6	8	1	4	...	4	7
Operators	496	1,281	92	72	19	44	72	11	6	6	40	212	1	50	9	251
Oven tenders .....	...	2	46	58	...	...	...	...	...	9	2	...	1	...	2	3
Painters	35	...	56	56	27	171	12	1	...	107	2	7	226	...	368	3
Pattern makers	17	2	3	3	3	14	...	...	...	16	39	...	32	...	...	...
Picklers .....	...	...	39	37	...	...	...	...	...	...	...	39	...	48	...	...
Platers	196	1	16	15	50	...	2	...	...	2	1	157	18	202	2	4
Polishers	465	4	...	...	6	110	325	...	...	168	270	...	...	...	...	...
Pressmen	20	55	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Repairmen	172	69	101	95	103	11	57	...	4	...	...	...	21	7	8	...
Sanders	12	4	...	...	4	2	...	...	...	51	8	...	...	...	43	...
Setters	180	76	2	...	4	...	...	...	...	...	...	...	1	1	...	...
Sharpeners	28	...	...	...	...	65	28	...	...	...	...	...	...	...	...	...
Shippers .....	...	24	...	...	...	...	...	1	...	...	60	1	1	...	4	...
Solderers	608	...	432	420	186	3	...	...	...	...	13	...	132	163	...	...
Supervisors	2	2	3	1	2	1	...	...	...	...	1	...	...	1	1	...
Technical men	8	...	16	13	3	2	...	1	3	...	...	6	1	1	...	...
Trimmers	2	...	3	...	...	11	...	...	...	...	...	...	...	...	...	17
Truck drivers .....	...	274	...	317	...	...	...	...	...	...	...	...	...	...	...	...
Welders	522	1	613	340	3	...	...	...	...	...	...	...	...	...	...	...
Winders	66	13	85	79	54	...	...	...	...	...	15	...	15	...	28	4
Other	58	66	75	73	7	8	19	10	10	5	17	28	1	8	9	...
Maintenance	164	416	203	301	120	14	77	...	52	50	125	69	67	29	16	1

TABLE 108—ELECTRICAL MACHINERY—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Number of workers exposed to specified materials by occupation																			
Antimony and its compounds	Halogenated hydrocarbons	Organic solvents	Core gases	Dermatitis producers	Temperature change	Chromium and its compounds	Coal dust (bituminous)	Sulfur dioxide	Asbestos dusts	Alcohols, esters, and ethers	Salts	Cyanides	Inks	Cadmium and its compounds	Mercury and its compounds	Sulfur	Fluorides	Other chemicals	Organic acids
313	283	278	239	219	186	169	120	110	96	94	77	75	48	48	41	32	18	16	3
1.2	1.1	1.1	0.9	0.9	0.7	0.7	0.5	0.5	0.4	0.4	0.3	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.0
...	52	90	...	8	...	...	...	...	89	55	18	...	...	...	20	...	4	...	...
...	85	...	...	...	...	...	...	3	...	...	...	...	...	...	...	...	...	...	...
13	6	33	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	1
...	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	233	...	180	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	3	...	6	...	6	4	...	...	8	...	...	...	...	4	...	...	...
...
19	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	2	24	...	...	...	...	...	...	...
...
...	...	3	...	...	...	...	6	...	...	...	9	...	...	...	...	...	...	...	...
...	8	...	...	...	...	...	...	...	...	...	...	6	...	...	...	...	...	...	...
...	...	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	1	17	...	...	...	49	...	...	7	2	3	2	20	...	...	...	...	...	...
...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
157	7	36	1	...	...	...	...	...	...	...	9	12	...	...	2	...	...	...	...
...	...	...	...	33	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...
...	1	20	...	...	...	114	...	...	...	...	10	37	...	46	...	...	5	...	1
...	...	...	...	...	...	...	...	...	...	...	8	...	...	...	...	...	...	...	...
...	...	1	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...
...	35	5	...	...	...	...	24	42	...	14	...	...	...	...	...	24	...	...	...
...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...
...
...
...
...	2	3	...	24	...	...	...	...	...	3	...	...	25	...	2	...	...	...	...
...	...	...	...	...	...	...	...	...	...	3	1	...	...	...	...	...	...	...	...
...	10	6	...	...	...	6	...	3	...	4	...	1	...	1	6	...	...	16	1
...
...
...	...	31	...	6	...	...	...	3	...	...	...	...	...	...	...	...	...	...	...
2	16	2	2	45	...	...	...	3	...	...	6	...	2	1	9	1	9	...	...
...	55	14	...	103	...	...	84	55	...	4	...	4	...	...	...	3	...	...	...

TABLE 108a—ELECTRICAL MACHINERY—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Other metals	Petroleum products	Other gases	Carbon monoxide	Lead and its compounds	Silicate dusts	Non-silicious dusts	Oils, fats, and waxes	Benzol	Silica dust	Organic dusts	Alkaline compounds
Number of workers exposed.....	5,872	3,766	2,968	2,582	1,681	1,321	954	818	768	758	723	624
General positive ventilation.....	5.4	0.05	2.9	16.5	5.5	29.4	...	...	91.4	10.9	0.7	...
General negative ventilation.....	19.6	0.05	30.9	37.4	14.3	35.9	13.4	...	91.8	41.4	17.7	19.5
Local exhaust	31.7	0.3	20.5	26.4	5.8	44.4	73.4	1.1	1.2	38.9	66.5	9.9
Enclosure	0.5	...	4.3	...	...	0.4	0.3	1.1	2.3	0.4	0.1	3.8
Wet method	6.4	0.1	...	...	...	5.9	1.2	...	...	...	...	...
Gas mask .....	...	...	...	...	...	...	...	...	...	...	...	...
Respirator	0.7	...	...	...	0.6	3.9	0.3	...	...	0.5	0.1	...
Pressure helmet	0.2	...	...	...	...	9.5	...	...	...	1.0	0.1	...
Protective clothing	23.5	25.6	0.4	...	3.9	11.8	...	1.1	1.2	1.6	...	58.0
Other	0.1	0.9	...	...	...	...	...	0.7	...	...	...	...

Instruments (Tables 109 and 109a)

This group represents a small number of workers. The principal exposures listed are other metals, non-silicious dusts, petroleum products, carbon monoxide, and other gases. General negative ventilation and local exhaust are the important control measures.

Gas and Electrical Fixtures (Tables 110 and 110a)

The principal exposures are other gases, carbon monoxide, and other metals, all of which are characteristic of metal fabricating industries. Assemblers and operators are the chief occupations. Negative ventilation and local exhaust are the principal methods of control. Enclosures, respirators, and protective clothing are noted in scattered exposures.

TABLE 108a—ELECTRICAL MACHINERY—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Lacquers and varnishes	Mineral acids	Paints and enamels	Coal tar products	Antimony and its compounds	Halogenated hydro- carbons	Organic solvents	Core gases	Chromium and its compounds	Coal dust (bituminous)	Sulfur dioxide	Asbestos dusts	Alcohols, esters, and ethers	Salts	Cyanides	Inks	Mercury and its compounds	Sulfur	Fluorides	Other chemicals
561	557	516	344	313	283	278	239	169	120	110	96	94	77	75	48	41	32	18	16
17.5	11.8	33.9	...	95.9	40.3	10.4	...	11.8	...	5.4	54.2	5.3	...	56.0	...	...	...	...	...
29.4	20.3	61.8	35.2	100.0	43.8	46.8	5.4	74.0	8.3	8.2	54.2	10.6	...	76.0	...	...	...	...	25.0
44.1	28.2	52.1	17.4	18.8	24.8	16.2	20.9	75.7	2.5	9.1	...	8.2	18.2	86.7	...	4.9	3.1	22.2	25.0
1.9	8.1	2.5	0.3	...	38.2	1.8	...	25.4	...	52.7	...	6.4	...	...	...	...	...	...	...
...
...	...	...	...	...	1.8	1.8	...	...	...	...	...	...	...	...	...	...	...	...	...
7.4	...	11.4	...	9.9	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13.1	...	27.7	...	40.2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
44.7	64.1	35.3	...	49.8	3.5	9.7	...	52.1	...	...	...	6.4	7.8	62.7	39.6	...	...	22.2	...
...	...	...	...	...	0.3	...	...	...	...	...	...	...	2.6	...	...	...	...	...	...

Materials for which no control measures were indicated are as follows: Dermatitis producers (219), Temperature change (186), Cadmium and its compounds (48), Organic acids (3).

TABLE 109a—INSTRUMENTS—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Other metals	Non-silicious dusts	Carbon monoxide	Other gases	Silicate dusts	Lead and its com- pounds	Paints and enamels	Lacquers and varnishes	Organic dusts	Organic solvents	Silica dust
Number of workers exposed.....	128	93	44	42	22	16	15	7	5	4	2
General negative ventilation.....	...	...	11.4	11.9	...	12.5	80.0	100.0	...	50.0	...
Local exhaust	60.0	79.6	25.0	26.2	100.0	6.2	66.7	85.7	40.0	50.0	100.0
Respirator .....	...	...	...	...	...	6.2	6.7	14.3	...	...	...
Protective clothing	15.6	...	11.4	11.9	...	...	...	...	...	...	...

Materials for which no control measures were indicated are as follows: Petroleum products (86), Mercury and its compounds (21), Alkaline compounds (8), Other chemicals (4), Benzol (3), Inks (3), Sulfur dioxide (3), Alcohols, esters and ethers (3), Mineral acids (3) and Coal tar products (2).

TABLE 109.—INSTRUMENTS—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																				
	Other metals	Non-silicious dusts	Petroleum products	Carbon monoxide	Other gases	Silicate dusts	Mercury and its compounds	Lead and its compounds	Paints and enamels	Alkaline compounds	Lacquers and varnishes	Organic dusts	Other chemicals	Organic solvents	Benzol	Inks	Sulfur dioxide	Alcohols, esters, and ethers	Mineral acids	Coal tar products	Silica dust
Total number of workers in plants surveyed, 262	128	93	86	44	42	22	21	16	15	8	7	5	4	4	3	3	3	3	3	2	2
Number of workers exposed.....	50.8	36.9	34.1	17.5	16.7	8.7	8.3	6.3	6.0	3.2	2.8	2.0	1.6	1.6	1.2	1.2	1.2	1.2	1.2	0.8	0.8
Percent of workers exposed.....	50.8	36.9	34.1	17.5	16.7	8.7	8.3	6.3	6.0	3.2	2.8	2.0	1.6	1.6	1.2	1.2	1.2	1.2	1.2	0.8	0.8
Assemblers	8	..	..	2	..	..	3	8	3	3	..	..	3	2	..	1	3	3	8	..	..
Bench workers .....	..	..	1	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
Electricians	2	..	..	..	..	1	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..
Glass blowers .....	..	..	..	9	9	..	9	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Heat treaters .....	..	..	..	..	1	1	..	..	..	..	..	1	..	..	1	1	..	..	..	1	..
Machinists	100	80	63	20	20	19	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..
Operators	8	8	17	..	..	..	..	..	7	..	2	..	..	..	..	..	..	..	..	..	..
Painters	5	5	..	10	10	..	..	..	5	5	5	..	..	..	..	..	..	..	..	..	..
Printers .....	..	..	2	..	..	..	..	1	..	..	..	..	..	..	2	2	..	..	..	..	..
Scalers .....	..	..	..	2	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Supervisors	1	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..
Technicians .....	..	..	..	..	..	..	6	..	..	..	..	..	..	..	..	..	..	..	..	1	..
Wood workers .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2
Other	4	..	3	..	..	2	3	2	..	..	..	2	..	..	..	..	..	..	..	..	..

Total number of workers in plants surveyed, 262

TABLE 111—STORAGE BATTERIES—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation												
	Other gases	Lead and its compounds	Carbon monoxide	Petroleum products	Organic dusts	Other metals	Mineral acids	Organic solvents	Antimony and its compounds	Silicate dusts	Salts	Alkaline compounds	Silica dust
Total number of workers in plants surveyed, 2,843													
Number of workers exposed	690	650	629	479	424	356	231	186	152	147	62	58	37
Percent of workers exposed	24.5	22.9	22.1	16.8	14.9	12.5	8.1	6.5	5.3	5.2	2.2	2.0	1.3
Annealers	74	25	74	...	...	5	...	...	...	...	...	...	...
Assemblers	192	40	192	187	11	...	8	4	...	...	...	...	3
Burners	17	8	12	...	...	...	...	...	5	...	...	...	...
Casters	105	37	130	70	23	...	...	...	12	89	...	...	...
Connectors	10	...	9	...	...	...	...	...	...	...	...	...	...
Feeders .....	...	17	...	...	...	...	5	...	8	...	...	...	4
Furnace tenders	6	...	12	...	...	1	...	...	6	...	...	...	4
Grinders .....	...	...	...	...	27	5	...	...	...	5	...	...	1
Inspectors	3	44	15	...	5	...	15	...	23	...	...	12	...
Laborers .....	...	78	...	...	8	...	14	...	30	...	...	...	3
Mixers	1	9	1	...	11	8	6	4	...	...	7	1	...
Operators	152	136	11	...	46	97	58	...	36	8	...	9	...
Painters	13	2	13	...	2	2	...	...	...	...	...	...	...
Pasters .....	...	8	3	3	151	10	16	4	...	...	1	...	...
Platers .....	...	...	...	...	2	14	12	...	...	...	...	10	...
Polishers .....	...	...	...	...	20	20	...	...	...	...	...	...	19
Separators .....	...	17	...	...	...	...	...	...	...	...	...	...	...
Shippers	22	23	27	22	14	7	38	...	...	...	...	9	...
Solderers	52	52	53	...	...	52	...	...	...	...	52	...	...
Stampers .....	...	...	...	...	70	...	...	...	...	...	...	...	...
Supervisors	1	4	6	1	4	...	4	3	3	...	...	...	...
Take-off men	8	...	11	...	...	...	...	4	...	...	...	...	...
Technical men	3	5	5	...	...	1	16	...	...	...	...	...	...
Truckers .....	...	40	7	...	...	...	21	...	3	...	...	...	...
Other	18	30	14	22	15	3	5	9	9	4	1	10	1
Maintenance	19	75	34	174	15	61	13	158	16	41	1	7	27

STORAGE BATTERIES—SUPPLEMENTARY TABLE

Percentage of Workers Exposed to Specified Materials

Materials	Wet Cell Batteries (Acid)	Dry Cell Batteries
	%	%
Lead	57.09	4.03
Sulfuric acid	21.71	0.11
Antimony	15.06	...
Asphalt	3.96	14.12
Carbon	1.09	19.25
Zinc	0.10	10.31
Ammonium chloride .....	...	1.80

Storage Batteries (Tables 111 and 111a)

This group includes both the manufacture of lead storage batteries and dry cells. The lead exposure in the manufacture of lead storage batteries is well known and has been the subject of several classic and detailed industrial health studies concerning lead poisoning. It should be emphasized, however, that no significant lead exposures are encountered in the

TABLE 111a — STORAGE BATTERIES — PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

[illegible]

Materials for which no control measures were indicated are as follows: Ink (9), Organic acids (2), Sulfur dioxide (2), Halogenated hydrocarbons (2), Benzol (2) and Dermatitis producers (1).

TABLE 112.—DENTAL SUPPLIES—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																						
	Organic dusts	Carbon monoxide	Other gases	Other metals	Non-silicious dusts	Silicate dusts	Mineral acids	Silica dust	Coal tar products	Oils, fats, and waxes	Halogenated hydrocarbons	Organic solvents	Petroleum products	Organic acids	Alcohols, esters, and ethers	Aldehydes	Mercury and its compounds	Alkaline compounds	Lacquers and varnishes	Other chemicals	Sulfur	Lead and its compounds	Paints and enamels
Total number of workers in plants surveyed, 192	113	102	102	98	96	82	71	69	47	45	41	41	40	37	34	31	29	24	10	9	7	1	1
Number of workers exposed	58.9	53.1	53.1	51.0	50.0	42.7	37.0	35.9	24.5	23.4	21.4	21.4	20.8	19.3	17.7	16.1	15.1	12.5	5.2	4.7	3.6	0.5	0.5
Percent of workers exposed																							
Bench workers.....	19	19	19	7	19	..	...	...	19	19	19	19	19	...	19	19	7	19	...	...	...	...	...
Ceramists.....	..	..	..	..	..	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Dentists.....	46	46	46	46	46	41	37	41	...	...	...	...	4	37	...	...	...	...	...	...	...	...	...
Errand boys.....	5	5	5	5	5	..	...	...	...	...	...	...	5	5	5	5	5	5	...	...	...	...	...
Finishers.....	1	...	...	...	1	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Foremen.....	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gold men.....	1	...	...	1	1	1	...	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...
Machinists.....	...	1	1	2	3	8	...	...	...	...	...	...	2	...	...	...	...	...	...	...	...	1	1
Plaster men.....	2	...	...	...	2	2	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Set-up men.....	...	...	...	...	1	1	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...
Technicians.....	39	31	31	37	18	32	34	24	23	19	17	17	10	...	10	7	17	...	10	9	7	...	...

TABLE 112a—DENTAL SUPPLIES—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Materials for which no control measures were indicated are as follows: Oils, fats and waxes (46), Organic acids (37), Sulfur (7) and Lead and its compounds (1).																			
	Organic dusts	Carbon monoxide	Other gases	Other metals	Non-silicious dusts	Silicate dusts	Mineral acids	Silica dust	Coal tar products	Halogenated hydrocarbons	Organic solvents	Petroleum products	Alcohols, esters, and ethers	Aldehydes	Mercury and its compounds	Alkaline compounds	Lacquers and varnishes	Other chemicals	Paints and enamels	
Number of workers exposed..	113	102	102	98	96	82	71	69	47	41	41	40	34	31	29	24	10	9	1	
General negative ventilation...	38.9	42.1	42.1	22.4	38.5	15.8	14.2	20.3	85.1	83.9	82.9	25.0	100.0	77.4	75.9	100.0	100.0	...	...
Local exhaust	67.2	54.9	54.9	79.6	38.5	86.6	11.3	66.7	21.3	...	...	...	...	...	...	...	...	88.9	100.0
Wet method .....	...	...	...	7.1	...	8.5	...	...	...	...	...	...	...	...	...	...	...	...	...

Materials for which no control measures were indicated are as follows: Oils, fats and waxes (46), Organic acids (37), Sulfur (7) and Lead and its compounds (1).

Optical Goods (Tables 113 and 113a)

Silicate dusts and non-silicious dusts represent materials encountered in grinding and polishing of optical goods and are the principal exposures of this group. These dusts are controlled primarily by wet methods.

TABLE 113—OPTICAL GOODS—EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation														
	Silicate dusts	Non-silicious dusts	Petroleum products	Carbon monoxide	Other gases	Other metals	Silica dust	Lead and its com- pounds	Alcohols, esters, and ethers	Organic dusts	Oils, fats, and waxes	Alkaline compounds	Cyanides	Dermatitis producers	Organic solvents
Total number of workers in plants surveyed, 268															
Number of workers exposed.	110	75	25	22	20	8	6	4	3	3	3	2	2	2	1
Percent of workers exposed.	41.0	28.0	9.3	8.2	7.5	3.0	2.2	1.5	1.1	1.1	1.1	0.7	0.7	0.7	0.4
Assemblers	24	2	5	5	3	3	...	4	2	...	3	2	...	...	...
Blockers .....	...	...	1	1	1	...	...	...	...	...	...	...	...	...	...
Cementers .....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Cutters	4	3	...	...	...	...	...	...	...	...	...	...	...	...	...
Delivery men.....	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...
Drillers	4	2	...	...	...	...	...	...	...	...	...	...	...	...	...
Edgers	5	4	...	...	...	...	...	...	1	...	...	...	...	...	...
Foremen	2	2	...	...	...	...	...	...	...	...	...	...	...	...	...
Graders .....	...	...	6	...	...	...	...	...	...	...	...	...	...	...	...
Grinders and polishers.....	59	51	9	16	16	...	6	...	...	3	...	...	2	...	...
Operators	2	2	...	...	...	...	...	...	...	...	...	...	...	...	...
Opticians	9	9	4	...	...	...	...	...	...	...	...	...	...	...	...
Porters	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...

TABLE 113a—OPTICAL GOODS—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Silicate dusts	Non-silicious dusts	Carbon monoxide	Other gases	Silica dust	Organic dusts	Cyanides
Number of workers exposed.....	110	75	22	20	6	3	12
General negative ventilation.....	4.5	5.3	27.3	30.0	...	66.7	100.0
Local exhaust	0.9	...	...	...	16.7	...	...
Wet method	90.9	88.0	...	...	50.0	...	...

Materials for which no control measures were indicated are as follows: Petroleum products (25), Other metals (8), Lead and its compounds (4), Alcohols, esters and ethers (3), Oils, fats and waxes (3), Alkaline compounds (2), Dermatitis producers (2) and Organic solvents (1).

TABLE 114—SIGNS (NON-ELECTRICAL) — EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																					
	Paints and enamels	Lacquers and varnishes	Organic dusts	Inks	Organic solvents	Other gases	Carbon monoxide	Dermatitis producers	Lead and its compounds	Silica dust	Petroleum products	Other metals	Silicate dusts	Non-silicious dusts	Oils, fats, and waxes	Mercury and its compounds	Mineral acids	Temperature change	Alkaline compounds	Alcohols, esters and ethers	Coal dust (bituminous)	Fluorides
Number of workers exposed.....	148	45	38	37	34	33	29	29	23	19	17	15	13	13	11	10	8	6	5	4	3	1
Percent of workers exposed.....	36.4	11.1	9.8	9.1	8.4	8.1	7.1	7.1	5.7	4.7	4.2	3.7	3.2	3.2	2.7	2.5	2.0	1.5	1.2	1.0	0.7	0.2
Applicators .....	..	..	..	..	3	..	..	1	..	1	2	..	..	..	2	..	..	..	..	..	..	..
Artists	20	10	2	16	6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Assemblers	17	..	..	..	..	4	4	..	..	..	..	..	..	..	..	..	..	4	..	..	..	..
Belt men .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Bill pasters	8	..	2	..	..	..	..	10	..	..	..	2	2	..	..	..	..	..	..	..	..	..
Carpenters .....	..	8	16	..	..	..	..	..	1	9	5	..	..	..	6	..	..	..	..	..	..	..
Cutters .....	..	..	1	..	5	..	..	2	..	4	..	4	..	..	..	..	..	..	..	..	..	..
Engravers .....	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Furnace men .....	..	..	..	..	14	..	2	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..
Operators	15	5	..	10	..	..	..	..	1	..	..	..	..	..	4	..	..	..	..	..	..	..
Painters	44	17	..	..	4	..	..	..	3	5	6	2	8	6	..	..	..	..	..	..	..	..
Polishers .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Printers	9	..	..	7	2	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..
Shapers .....	..	..	..	..	..	5	5	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Sheet metal workers.....	..	..	..	..	7	7	4	..	7	..	..	7	..	4	..	..	..	..	..	..	..	..
Shippers .....	..	..	15	8	..	..	..	12	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Sign makers .....	..	..	..	..	..	..	8	2	9	..	..	..	..	..	..	8	8	..	..	..	..	..
Other	24	13	..	1	..	7	8	2	..	..	3	..	3	3	..	2	..	1	..	..	1	..
Maintenance	2	..	2	..	..	..	3	..	..	..	1	..	..	..	..	..	..	..	4	..	8	..

Total number of workers in
plants surveyed, 407

TABLE 115 — TOYS AND UNCLASSIFIED NOVELTIES — EXPOSURE BY OCCUPATION TO SPECIFIED MATERIALS

Occupations	Number of workers exposed to specified materials by occupation																						
	Coal tar products	Other metals	Organic dusts	Silica dust	Non-silicious dusts	Silicate dusts	Alkaline compounds	Paints and enamels	Dermatitis producers	Lacquers and varnishes	Petroleum products	Other gases	Carbon monoxide	Oils, fats, and waxes	Salts	Phosphorus and its compounds	Antimony and its compounds	Organic solvents	Cadmium and its compounds	Inks	Coal dust (bituminous)	Alcohols, esters, and ethers	Lead and its compounds
Total number of workers in plants surveyed, 847	132	127	110	109	96	95	35	33	32	32	29	23	22	20	14	13	13	10	7	6	4	1	2
Number of workers exposed....	132	127	110	109	96	95	35	33	32	32	29	23	22	20	14	13	13	10	7	6	4	1	2
Percent of workers exposed.....	15.6	15.0	13.0	12.9	11.3	11.2	4.1	3.9	3.8	3.8	3.4	2.7	2.6	2.4	1.7	1.5	1.5	1.2	0.8	0.7	0.5	0.2	0.2
Assemblers	62	...	30	...	1	...	...	...	12	...	...	...	4	...	...	...	...	...	...	...	...	...	...
Cupalo tenders .....	...	...	...	...	1	1	...	...	...	...	...	5	6	...	...	...	...	...	...	...	1	...	...
Drivers .....	...	...	...	...	...	...	...	...	6	...	...	...	...	2	4	...	...	...	...	...	...	...	...
Fillers .....	...	...	18	18	...	2	...	2	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...
Finishers .....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Grinders	19	...	...	...	18	...	...	...	...	...	...	...	...	18	...	...	...	...	...	...	...	...	...
Inspectors .....	...	...	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Laborers	15	16	...	10	...	10	6	...	2	...	...	6	...	...	6	...	...	...	...	...	...	...	...
Machinists .....	...	23	...	...	...	13	...	...	...	...	10	...	...	...	...	...	...	...	...	...	...	...	...
Molders .....	...	50	...	50	...	53	...	...	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Operators	52	2	19	16	49	...	2	...	...	...	19	5	5	...	2	...	...	...	...	...	...	...	...
Painters .....	...	...	...	2	1	1	...	30	1	29	...	4	4	...	...	13	13	6	...	...	...	...	1
Patrollers .....	...	...	1	...	...	...	13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Rollers .....	...	...	...	...	...	...	12	...	...	...	...	4	...	...	...	...	...	...	...	...	...	...	...
Sanders .....	...	...	...	6	...	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Sewers .....	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Shippers .....	...	...	...	...	...	...	...	...	7	...	...	...	...	...	...	...	...	...	...	...	2	2	...
Wood workers	13	10	3	...	13	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...
Other	3	...	11	...	2	3	1	1	1	1	...	3	...	...	1	...	...	...	...	...	...	...	...
Maintenance .....	...	1	5	...	...	...	1	...	...	...	...	...	3	...	...	...	...	...	...	...	...	3	...

Signs (Non-Electrical) (Tables 114 and 114a)

Paints and lacquers are the principal exposures in this group. The occupations and control measures are widely diversified.

TABLE 114a—SIGNS (NON-ELECTRICAL)—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Paints and enamels	Lacquers and varnishes	Organic dusts	Organic solvents	Other gases	Carbon monoxide	Lead and its compounds	Silica dust	Other metals	Silicate dusts	Non-silicious dusts	Fluorides
Number of workers exposed....	148	45	38	34	33	29	23	19	15	13	13	1
General positive ventilation....	1.3	...	...	5.7	...	...	...	...	13.3	...	...	...
General negative ventilation....	1.3	6.6	...	5.7	...	...	4.3	...	...	...	...	...
Local exhaust	4.0	6.6	5.3	2.9	27.3	41.4	...	...	13.3	23.1	7.7	100.0
Enclosure	3.4	...	...	...	...	...	...	...	...	7.7	7.7	...
Wet method .....	...	...	...	...	...	...	...	47.4	26.7	61.5	61.5	...
Respirator	6.7	11.1	...	...	...	...	13.0	...	...	7.7	7.7	...
Protective clothing.....	3.4	4.4	...	...	...	...	...	20.0	...	...	...	100.0

Materials for which no control measures were indicated are as follows: Inks (37), Dermatitis producers (29), Petroleum products (17), Oils, fats and waxes (11), Mercury and its compounds (10), Mineral acids (8), Temperature change (6), Alkaline compounds (5), Alcohols, esters and ethers (4) and Coal dust (bituminous) (3).

Toys and Unclassified Novelties (Tables 115 and 115a)

Coal tar compounds encountered in bakelite products, other metals, organic dusts, silica dust, non-silicious dusts, and silicate dusts, are the principal exposures in the order listed. The occupations are rather widely diversified, and local exhaust is the only significant control measure.

TABLE 115a—TOYS AND UNCLASSIFIED NOVELTIES—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Coal tar products	Other metals	Organic dusts	Silica dust	Non-silicious dusts	Silicate dusts	Paints and enamels	Lacquers and varnishes	Petroleum products	Carbon monoxide	Oils, fats, and waxes	Organic solvents	Lead and its compounds
Number of workers exposed	132	127	110	109	96	95	33	32	29	22	20	10	2
General negative ventilation	...	0.8	...	...	1.0	...	48.5	9.4	...	...	...	...	100.0
Local exhaust.....	2.3	14.2	33.6	21.1	18.7	1.0	21.2	68.7	41.4	18.2	90.0	80.0	50.0
Enclosure .....	...	...	...	7.3	...	8.4	...	...	...	...	...	...	...
Respirator .....	...	3.9	1.8	...	5.2	...	6.1	3.1	...	...	...	...	50.0
Protective clothing.....	...	0.8	...	...	...	...	12.1	3.1	...	...	...	...	...
Other .....	...	...	...	...	...	...	9.1	...	...	...	...	...	...

Materials for which no control measures were indicated are as follows: Alkaline compounds (35), Dermatitis producers (32), Other gases (23), Salts (14), Phosphorus and compounds (13), Antimony and its compounds (13), Cadmium and its compounds (7), Inks (6), Coal dust (bituminous) (4), Alcohols, esters and ethers (2) and Other chemicals (1).

TABLE 116a—OTHER MANUFACTURING PLANTS—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

	(Organic dusts	Petroleum products	(Other metals	Non-silicious dusts	(Organic solvents	Silica dust	Carbon monoxide	Other gases	Silicate dusts	Lead and its com- pounds	Lacquers and varnishes	Alkaline compounds	Asbestos dusts	Mineral acids	Oils, fats, and waxes	(Chromium and its compounds	Paints and enamels	Dyes	Coal tar products	Cyanides
Number of workers exposed.....	372	302	331	326	186	162	119	108	105	103	96	84	69	67	65	28	11	9	7	5
General positive ventilation.....	..	..	..	..	..	..	..	..	..	..	2.1	..	..	..	..	..	..	..	..	..
General negative ventilation.....	7.0	..	7.5	1.2	1.2	..	..	..	..	..	2.1	..	..	..	..	..	..	..	..	..
Local exhaust .....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Enclosure	58.1	..	34.4	23.3	0.5	49.4	49.1	24.1	20.0	9.7	31.2	8.3	1.4	41.8	..	85.7	18.2	..	42.8	..
Wet method	1.1	..	1.2	..	..	2.5	4.5	3.7	1.9	1.0	..	..	..	..	..	3.1	14.3	..	..	..
Respirator	5.4	..	3.0	27.7	..	5.5	..	11.4	..	..	..	..	..	..	..	..	..	..	..	..
Pressure helmet .....	..	..	0.9	..	..	..	..	2.8	..	..	5.2	..	..	8.0	..	..	..	..	..	..
Protective clothing .....	..	..	0.3	..	..	0.6	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Other .....	..	0.5	2.4	..	1.6	0.6	..	..	..	..	1.0	4.8	..	3.0	..	..	33.3	..	80.0	..

Materials for which no control measures were indicated are as follows: Inks (116), Dermatitis producers (88), Coal dust (bituminous) (28), Salts (7), Mercury and its compounds (3), Alcohols, esters and ethers (2), Other chemicals (1) and Halogenated hydrocarbons (1).

Other Manufacturing Plants (Tables 116 and 116a)

Since this group includes all manufacturing plants not otherwise classified and represents a diversity of manufacturing operations, significant conclusions cannot be drawn from the accompanying table. It is noted, however, that organic dusts, petroleum products, other metals, and non-silicious dusts constitute the principal exposures.

TRANSPORTATION AND COMMUNICATION

Garages (Tables 117 and 117a)

The principal exposures in garages are carbon monoxide, petroleum products, other metals, and organic solvents (petroleum distillates). Some of the minor exposures, such as lacquers and varnish, alkaline compounds, oils, fats, and waxes, are associated with cleaning, painting, and polishing operations. Lead exposures were indicated in body soldering operations and not in the combustion products of ethyl gasoline. The chief control measure was general negative ventilation. Local exhaust and respirators were extensively used in spray painting operations.

TABLE 117—GARAGES—EXPOSURES TO SPECIFIED MATERIALS

Materials	Number and Percentage of Workers Exposed to the Specified Material All Garages	
	No.	%
Number of workers in plants surveyed.....	3,061	
Carbon monoxide	1,741	56.9
Petroleum products	1,278	41.8
Other metals	653	21.3
Organic solvents	575	18.8
Other gases	348	11.4
Non-silicious dusts	287	9.4
Lacquers and varnishes.....	268	8.8
Paints and enamels.....	233	7.6
Alkaline compounds	228	7.4
Silicate dusts	224	7.3
Lead and its compounds.....	206	6.7
Mineral acids	83	2.7
Oils, fats, and waxes.....	61	2.0
Silica dust	34	1.1
Organic dusts	15	0.5
Coal dust (bituminous).....	9	0.3
Halogenated hydrocarbons	6	0.2
Benzol	4	0.1
Alcohols, esters, and ethers.....	1	0.0

TABLE 117a—GARAGES—PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Carbon monoxide	Other metals	Organic solvents	Other gases	Non-silicious dusts	Laquers and varnishes	Paints and enamels	Alkaline compounds	Silicate dusts	Lead and its compounds	Mineral acids	Oils, fats, and waxes	Silica dust	Organic dusts	Coal dust (bituminous)
Number of workers exposed	1,741	653	575	348	287	208	233	228	224	206	83	61	34	15	9
General positive ventilation	6.7	2.7	1.9	4.3	5.9	1.9	2.6	...	...	1.4	...	...	...	26.7	11.1
General negative ventilation	23.2	17.0	10.8	12.0	20.5	25.4	23.2	...	12.9	13.6	18.1	4.9	20.6	53.3	11.1
Local exhaust	6.5	...	0.8	...	...	16.8	18.4	...	3.6	1.4	...	...	2.9	...	...
Enclosure .....	...	...	...	...	...	3.3	3.9	...	...	...	...	...	...	...	...
Wet method .....	...	0.4	...	...	1.0	...	...	...	...	...	...	...	...	...	...
Respirator .....	...	2.1	...	...	1.7	26.5	33.9	...	...	6.3	...	...	...	...	...
Protective clothing	0.3	17.1	...	...	...	0.3	0.8	2.6	...	4.4	...	...	...	...	...

Materials for which no control measures were indicated are as follows: Petroleum products (1,278), Halogenated hydrocarbons (6), Benzol (4) and Alcohols, esters and ethers (1).

DOMESTIC AND PERSONAL SERVICE

Table 118 indicates the percentage of workers exposed to the specified materials for laundering and dry cleaning establishments, both combined and as separate groups. Table 119 indicates the percentage of total exposures in each sub-division of the domestic and personal service group. Plants which had dry cleaning service were listed under the classification of dry cleaning and dyeing regardless of whether or not any laundry service was rendered. The principal exposures are alkaline compounds, indicating the various types of detergents used in washing processes and organic solvents used in the dry cleaning operations. Many minor exposures such as alcohol, benzol, and others, were used as spotting agents in cleaning processes. The percentage of workers exposed to injurious materials in the domestic and personal service group is relatively low, since many individuals are engaged in work where there is no apparent exposure to such materials. The control measures indicated in Tables 119a and 119b are confined principally to general negative ventilation and local exhaust.

TABLE 118—DOMESTIC AND PERSONAL SERVICE—EXPOSURES TO SPECIFIED MATERIALS

Materials	Number and Percentage of Workers Exposed to the Specified Material in Each Industrial Subdivision					
	All domestic and personal service plants		Laundries		Dry cleaning and dyeing	
Number of workers in plants surveyed.....	3,635		1,851		1,784	
	No.	%	No.	%	No.	%
Alkaline compounds	283	7.8	156	8.4	127	7.1
Organic solvents	236	6.5	16	0.9	220	12.3
Other gases	142	3.9	41	2.2	101	5.7
Carbon monoxide	117	3.2	66	3.6	51	2.9
Organic acids	105	2.9	23	1.2	82	4.6
Alcohols, esters, and ethers.....	95	2.6	12	0.7	83	4.6
Halogenated hydrocarbons	82	2.3	15	0.8	67	3.8
Coal dust (bituminous).....	81	2.2	45	2.4	36	2.0
Petroleum products	54	1.5	25	1.4	29	1.6
Benzol	39	1.1	.....	.....	39	2.2
Inks	36	1.0	22	1.2	14	0.8
Dyes	28	0.8	3	0.2	25	1.4
Organic dusts	26	0.7	7	0.4	19	1.1
Mineral acids	14	0.4	.....	.....	14	0.8
Salts	12	0.3	1	0.1	11	0.6
Coal tar products.....	9	0.2	1	0.1	8	0.4
Fluorides	7	0.2	1	0.1	6	0.3
Dermatitis producers	5	0.1	3	0.2	2	0.1
Other chemicals	3	0.1	1	0.1	2	0.1
Non-silicious dusts	2	0.1	.....	.....	2	0.1
Other metals	2	0.1	.....	.....	2	0.1
Oils, fats, and waxes.....	2	0.1	1	0.1	1	0.1
Silicate dusts	1	0.0	.....	.....	1	0.1

TABLE 119—DOMESTIC AND PERSONAL SERVICE—EXPOSURE TO SPECIFIED MATERIALS

Materials	Number of workers exposed to specified materials	Number and Percentage of Total Exposures to the Specified Materials in Each Industrial Subdivision			
		Laundries		Dry cleaning and dyeing	
		No.	%	No.	%
Alkaline compounds	283	156	55.1	127	44.9
Organic solvents	236	16	6.8	220	93.2
Other gases	142	41	28.9	101	71.1
Carbon monoxide	117	66	56.4	51	43.6
Organic acids	105	23	21.9	82	78.1
Alcohols, esters and ethers.....	95	12	12.6	83	87.4
Halogenated hydrocarbons	82	15	18.3	67	81.7
Coal dust (bituminous).....	81	45	55.6	36	44.4
Petroleum products	54	25	46.3	29	53.7
Benzol	39	.....	.....	39	100.0
Inks	36	22	61.1	14	38.9
Dyes	28	3	10.7	25	89.3
Organic dusts	26	7	26.9	19	73.1
Mineral acids	14	.....	.....	14	100.0
Salts	12	1	8.3	11	91.7
Coal tar products.....	9	1	11.1	8	88.9
Fluorides	7	1	14.3	6	85.7
Dermatitis producers	5	3	60.0	2	40.0
Other chemicals	3	1	33.3	2	67.7
Non-silicious dusts	2	.....	.....	2	100.0
Other metals	2	.....	.....	2	100.0
Oils, fats, and waxes.....	2	1	50.0	1	50.0
Silicate dusts	1	.....	.....	1	100.0

TABLE 119a — LAUNDRIES — PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Alkaline compounds	Carbon monoxide	Coal dust (bituminous)	Other gases	Petroleum products	Organic solvents	Halogenated hydrocarbons	Alcohols, esters, and ethers	Organic dusts
Number of workers exposed.....	156	66	45	41	25	16	15	12	7
General negative ventilation.....	....	7.6	6.6	9.7	4.0	12.5	13.3	41.7	....
Local exhaust .....	....	74.2	....	12.2	....	....	40.0	....	57.1
Enclosure	1.3	....	....	2.4	....	37.5	20.0	....	....

Materials for which no control measures were indicated are as follows: Organic acids (23), Inks (22), Dyes (3), Dermatitis producers (3), Other chemicals (1), Coal tar products (1), Fluorides (1), Oils, fats and waxes (1) and Salts (1).

TABLE 119b — DRY CLEANING AND DYEING — PERCENTAGE OF EXPOSED WORKERS PROVIDED WITH CONTROL MEASURES FOR SPECIFIED MATERIALS

Control Measures	Organic solvents	Alkaline compounds	Other gases	Alcohols, esters, and ethers	Organic acids	Halogenated hydrocarbons	Carbon monoxide	Benzol	Coal dust (bituminous)	Petroleum products	Dyes	Organic dusts	Mineral acids	Salts
Number of workers exposed.....	220	127	101	83	82	67	51	39	36	29	25	19	14	11
General positive ventilation.....	....	....	....	....	....	4.5	....	....	....	....	4.0	....	7.1	....
General negative ventilation.....	16.8	....	10.9	10.8	2.4	28.3	5.9	5.1	8.3	13.8	4.0	....	7.1	....
Local exhaust	16.4	....	3.0	3.6	....	7.5	70.6	....	....	3.4	....	21.0	....	....
Enclosure	11.8	4.7	....	....	2.4	7.5	....	....	....	3.4	....	....	....	9.1
Other .....	....	1.6	....	....	....	....	....	....	....	10.3	....	....	....	....

Materials for which no control measures were indicated are as follows: Inks (14), Coal tar products (8), Fluorides (6), Other chemicals (2), Dermatitis producers (2), Non-silicious dusts (2), Other metals (2), Silicate dusts (1) and Oils, fats and waxes (1).

SUMMARY

Exposure by occupation to injurious materials have been presented in detail for each of the 93 industrial groups, and the data may now be given in a summarized form. Table 120 indicates the material groups in each major industrial group surveyed to which 10% or more workers were exposed. It can be seen from this table, for example, that in the metal industry (except iron and steel) 10% or more workers are exposed to nine of the major materials. It can also be noted that carbon monoxide gas occurs in eight industry groups to the extent that 10% or more of the workers are potentially exposed. *However, it cannot be assumed from this table that materials to which less than 10% of the workers are exposed may not constitute serious occupational disease problems.* For example, only 0.3% of the workers in the miscellaneous manufacturing group show an exposure to mercury and its compounds. Yet in Ohio certain factories in this group are known to be acutely concerned with mercury poisoning.

Table 121 presents the summarized data for all industries combined, classified according to types of materials. Some of the more important exposures are indicated according to the physical state in which they are encountered. It can be seen that inorganic non-metallic dusts, gases, and metallic dusts and compounds are the most prevalent types of substances encountered in Ohio's industrial environment. Solvents, oils, and various types of chemicals, although not encountered as frequently, may affect a substantial number of the working population.

In the discussion of the scope and plan of this survey, it was emphasized that a study of all the industrial establishments in Ohio was impossible in view of the personnel and time available for the work. It was further indicated, however, that the sample represents an adequate portion of Ohio industries from which certain conclusions may be drawn. Table 122 shows the expected number of persons in Ohio industry exposed to the various material groups. These estimates were made by multiplying the percentage of exposure for each material by the total number of workers in each major industrial group as indicated by the 1930 census. For example, this table shows 26,622 workers in the clay, glass, and stone industry as the probable number exposed to silicate dusts. Table 11 shows that according to the survey, 50.4% of the workers in this group are potentially exposed to silicate dusts. Table 2 (1930 census figures) indicates a total of 52,822 workers employed in the clay, glass, and stone industry (also shown at the top of Table 122). Therefore, 50.4% of 52,822 workers equals 26,622 workers, indicated as the number of persons possibly exposed to silicate dusts in this industrial group. The expected exposure to a specified material for all Ohio industries combined is the sum of the expected exposures for each industrial group. The materials are listed in order of their expected incidence for all industries combined.

Table 120

MATERIALS IN EACH INDUSTRY OR SERVICE GROUP SURVEYED
TO WHICH 10 PERCENT OR MORE WORKERS WERE EXPOSED

Industry or Service Group	Material	Workers Exposed	
		Percent	Number
Extraction of minerals.....	Coal dust (bituminous) .	94.5	7,305
	Silicate dusts	87.1	6,732
	Other gases	60.1	4,645
	Silica dust	58.3	4,510
	Carbon monoxide	57.8	4,467
	Non-silicious dusts	15.3	1,179
Chemical and allied.....	Alkaline compounds	15.7	2,329
	Salts	15.5	2,305
	Organic dusts	14.8	2,192
	Other gases	13.4	1,986
	Petroleum products	11.5	1,702
	Other metals	10.4	1,546
	Carbon monoxide	10.0	1,487
Cigar and tobacco.....	Organic dusts	89.2	2,289
Clay, glass and stone.....	Silicate dusts	50.4	10,472
	Silica dust	43.4	9,010
	Carbon monoxide	18.3	3,793
	Other gases	12.5	2,598
Clothing	Organic dusts	16.2	2,225
Food and allied.....	Dermatitis producers ..	23.9	3,504
	Organic dusts	16.5	2,415
	Other gases	12.2	1,784
	Carbon monoxide	11.4	1,673
Iron and steel.....	Other metals	35.7	40,180
	Carbon monoxide	20.9	23,513
	Other gases	19.7	22,163
	Petroleum products	19.2	21,575
	Silicate dusts	14.6	16,363
	Temperature change ...	11.7	13,158
	Silica dust	10.4	11,665

Table 120

MATERIALS IN EACH INDUSTRY OR SERVICE GROUP SURVEYED
TO WHICH 10 PERCENT OR MORE WORKERS WERE EXPOSED

Industry or Service Group	Material	Workers Exposed	
		Percent	Number
Metal industries (except iron and steel)	Other metals	39.9	6,132
	Silicate dusts	26.0	4,007
	Silica dust	22.1	3,407
	Carbon monoxide	16.9	2,597
	Lead and its compounds	15.1	2,321
	Other gases	14.9	2,295
	Petroleum products	12.5	1,916
	Core gases	11.0	1,693
Leather	Non-silicious dusts	10.8	1,658
	Dermatitis producers	12.7	824
Lumber and furniture.....	Organic solvents	10.8	699
	Organic dusts	31.0	2,542
Paper and printing.....	Inks	20.7	2,347
	Petroleum products	15.1	1,713
	Organic solvents	11.3	1,282
Textile	Organic dusts	27.5	2,202
Rubber	Silicate dusts	20.8	3,751
	Organic solvents	19.3	3,478
	Organic dusts	16.2	2,932
	Other metals	11.3	2,038
Miscellaneous manufacturing.....	Other metals	19.3	7,670
	Other gases	13.7	5,454
	Petroleum products	12.9	5,146
	Carbon monoxide	12.0	4,770
Transportation and communication.....	Carbon monoxide	56.9	1,741
	Petroleum products	41.8	1,278
	Other metals	21.3	653
	Organic solvents	13.8	575
	Other gases	11.4	348

Table 121

NUMBER AND PERCENTAGE OF PERSONS EXPOSED TO SOME OF
THE IMPORTANT MATERIALS IN THE SAMPLE STUDIED

Materials	Number of Persons Exposed	Percent of Persons Exposed
Inorganic Nonmetallic Dusts:		
Silicate dusts	45,748	15.2
Silica dust	31,093	10.3
Non-silicious dusts	19,124	6.4
Coal dust (bituminous)	14,470	4.8
Asbestos dusts	585	0.2
Coal dust (anthracite)	251	0.1
Gases:		
Carbon monoxide	46,043	15.3
Other gases	43,382	14.4
Sulfur dioxide	416	0.1
Hydrogen sulfide	128	0.0
Metallic Dusts and Compounds:		
Other metals	61,420	20.4
Lead and its compounds	12,865	4.3
Mercury and its compounds	141	0.0
Arsenic and its compounds	130	0.0
Solvents:		
Organic solvents (not otherwise specified)	10,046	3.3
Benzol	1,873	0.6
Alcohols, esters, and ethers	1,795	0.6
Halogenated hydrocarbons	1,110	0.4
Petroleum products	37,865	12.6
Organic dusts	25,701	8.5
Alkaline compounds	10,189	3.4
Dermatitis producers	8,827	2.9
Acids (mineral and organic)	6,886	2.3
Oils, fats, and waxes	6,878	2.3
Other chemicals	2,529	0.8
Coal tar products	1,652	0.5
Accelerators	1,101	0.4

Table 122

EXPECTED NUMBER OF PERSONS IN OHIO EXPOSED TO INDICATED MATERIALS BASED ON DATA OBTAINED IN THE SURVEY

Materials	Expected Number of Persons Exposed					
	Total	Extraction of minerals	Chemical and allied	Cigar and tobacco factories	Clay, glass and stone	Clothing
1930 census data .....	.....	30,624	36,667	8,007	52,822	34,306
Other metals	198,792	61	3,813	56	3,856	103
Carbon monoxide	157,331	17,701	3,667	32	9,666	549
Silicate dusts	144,597	26,674	3,007	3	26,622	34
Other gases	141,951	18,405	4,913	40	6,603	480
Petroleum products	129,549	2,572	4,216	120	2,377	309
Silica dust	95,467	17,854	1,136	16	22,925	69
Organic dusts	76,288	92	5,427	7,142	1,479	5,558
Non-silicious dusts	61,013	4,685	3,630	56	4,807	103
Temperature change	52,285	....	17	....	3,592	....
Coal dust (bituminous)	51,398	28,940	2,457	24	3,064	34
Lead and its compounds	38,315	122	2,017	....	3,856	34
Organic solvents	36,235	4	2,860	224	951	69
Alkaline compounds	31,868	4	5,757	16	1,954	69
Dermatitis producers	27,331	31	2,750	240	158	69
Core gases	26,495	....	....	....	53	....
Oils, fats, and waxes	19,917	306	3,190	....	370	34
Mineral acids	17,943	31	1,943	....	264	34
Paints and enamels	17,325	31	1,430	....	1,426	15
Inks	16,248	....	843	....	53	103
Lacquers and varnishes	14,796	....	1,210	....	845	34
Salts	10,818	....	5,683	3	317	34
Other chemicals	7,524	8	2,310	....	158	....
Sulfur	6,573	490	1,723	....	106	....
Benzol	6,042	....	513	....	53	....
Dyes	5,475	....	1,650	....	20	34
Alcohols, esters, and ethers	5,385	....	843	24	105	5
Antimony and its compounds	5,086	....	1,393	....	106	....
Coal tar products	4,558	....	1,503	....	317	3
Chromium and its compounds	4,520	....	1,833	....	317	....
Halogenated hydrocarbons	3,929	....	220	....	....	34
Accelerators	3,676	....	17	....	....	....
Organic acids	3,194	....	953	....	25	....
Manganese and its compounds	3,044	....	293	....	370	....
Infections	2,975	....	256	....	53	....
Cyanides	2,392	....	37	....	15	13
Fluorides	2,164	....	440	....	158	....
Phosphorus and compounds	1,788	....	1,247	....	....	....
Asbestos dusts	1,776	31	146	....	317	....
Cadmium and its compounds	1,250	....	110	....	13	....
Sulfur dioxide	1,077	....	256	....	....	....
Medicinals	807	....	770	....	....	....
Coal dust (anthracite)	796	....	....	....	....	....
Aldehydes	602	....	256	....	....	....
Mercury and its compounds	376	....	37	....	....	15
Arsenic and its compounds	366	....	110	....	158	....
Hydrogen sulfide	348	....	110	....	....	....
Aniline and its compounds	150	....	146	....	....	....
Selenium and its compounds	106	....	....	....	106	....
Amines	54	....	37	....	....	....

Table 122

EXPECTED NUMBER OF PERSONS IN OHIO EXPOSED TO INDICATED MATERIALS BASED ON DATA OBTAINED IN THE SURVEY

Expected Number of Persons Exposed										
Food and allied	Iron and steel	Metal industries (except iron and steel)	Leather	Lumber and furniture	Paper and printing	Textile	Rubber	Miscellaneous manufacturing	Transportation and communication	Domestic and personal service
42,954	398,078	27,628	16,729	29,594	54,171	13,903	60,871	99,206	24,947	21,449
472	142,114	11,024	151	2,042	3,629	111	6,878	19,147	5,314	21
4,897	83,198	4,669	251	1,746	2,438	209	1,522	11,905	14,195	686
301	58,119	7,183	17	621	1,733	139	12,661	5,655	1,821	7
5,240	78,421	4,117	368	1,480	2,329	153	2,130	13,591	2,844	837
1,890	76,431	3,454	201	1,154	8,180	653	4,444	12,798	10,428	322
43	41,400	6,106	167	1,982	163	14	243	3,075	274	....
7,087	12,738	1,437	1,556	9,174	4,984	3,823	9,861	5,655	125	150
129	30,652	2,984	234	1,065	596	83	5,357	4,266	2,345	21
....	46,575	1,575	....	30	....	....	....	496	....	....
945	12,738	359	67	385	542	153	548	595	75	472
258	10,748	4,172	17	651	4,550	42	3,531	6,646	1,671	....
258	2,787	193	1,807	1,006	6,121	139	11,748	1,984	4,690	1,394
1,675	9,554	801	217	89	1,246	348	4,139	2,480	1,846	1,673
10,266	2,388	442	2,125	2,575	4,333	28	913	992	....	21
....	22,690	3,039	....	118	....	....	....	595	....	....
1,375	5,573	1,188	502	562	704	556	2,557	2,480	499	21
301	8,758	967	17	207	1,138	153	791	2,579	674	86
172	7,165	387	50	1,450	325	264	730	1,984	1,896	....
215	796	138	301	296	11,213	264	1,217	595	....	214
43	3,981	580	184	2,072	650	195	421	2,381	2,195	....
1,117	1,592	608	100	30	596	56	122	496	....	64
258	2,388	276	....	4	1,029	28	548	496	....	21
43	117	28	....	....	5	28	3,835	198	....	....
....	398	28	167	30	1,354	14	1,339	1,885	25	236
86	141	7	251	562	1,246	598	609	99	....	172
1,117	398	9	268	266	163	97	730	794	8	558
....	398	138	....	30	5	....	1,826	1,190	....	....
....	1,194	7	....	30	108	2	61	1,290	....	43
....	796	718	....	118	108	28	7	595	....	....
....	398	55	17	7	921	28	913	793	50	493
....	....	....	....	....	....	....	3,652	7	....	....
172	....	55	335	30	217	222	365	198	....	622
....	1,990	193	....	....	....	....	....	198	....	....
1,976	....	....	468	....	....	222	....	....	....	....
....	1,194	414	....	89	271	....	61	298	....	....
86	398	856	....	30	54	....	....	99	....	43
....	398	111	....	....	....	....	....	32	....	....
....	796	28	....	....	....	....	61	397	....	....
....	398	359	....	118	54	....	....	198	....	....
9	398	....	17	....	....	....	....	397	....	....
12	25	....	....	....	....	....	....	....	....	....
....	796	....	....	....	....	....	....	....	....	....
172	7	....	....	11	54	3	....	99	....	....
9	....	7	....	....	....	....	10	298	....	....
43	....	....	....	30	....	....	....	25	....	....
....	....	55	....	....	....	....	183	....	....	....
....	4	....	....	....	....	....	....	....	....	....
....
....	....	....	17	....	....	....	....	....	....	....

CONCLUSIONS

Ohio ranks fourth in the number of gainfully employed workers and second in the number of workers employed in hazardous occupations according to the 1930 census. There are approximately a million employes in the industries considered in this study. About three-fourths of these are employed in such industries as mining, chemical, metal, clay and glass, rubber, and electrical equipment. Such industries have many inherently hazardous operations. The survey included a study of the individual occupations of over three hundred thousand employes or approximately one-third of the gainfully employed workers in the types of industry studied. The sample for the survey was selected to include proper representations of the various types of industrial activity. The analysis of this sample and the expansion of the resulting data has enabled the Department of Health to evaluate the industrial health problems of Ohio industry.

Exposures to more than five hundred materials encountered in the survey were classified into fifty material exposure groups. The incidence of expected exposures to these material groups was indicated in Table 122. It is noted further that one might expect each of the five leading types of materials to affect the environment of more than a hundred thousand workers. Each of sixteen additional materials might affect the environments of 10,000 to 100,000 workers; each of nineteen material exposures are indicated for 1,000 to 10,000 workers and nine material exposures for less than 1,000.

The number of persons exposed to some of the important types of materials in the sample studied has been indicated. This data, expanded to include all of the industrial workers of Ohio, would indicate the expected exposures to inorganic non-metallic dusts as follows:

Silicate dusts	145,000
Silica dust	95,000
Non-silicious dusts	61,000
Coal dust	52,000
Asbestos dust	1,800

It is apparent that these dusts are widely prevalent in Ohio industry. It is also known through reports received by the Ohio Department of Health that some of these dusts have caused actual injury to the health of certain workers. It is evident, therefore, that additional studies should be made to determine the amount of injury sustained by persons exposed to these dusts. Such studies should consist of exact chemical and engineering determinations correlated with medical findings.

The prevalence of certain other materials is indicated by their high incidence in Ohio industry. The expected exposures to such substances are included in the following:

Other metals	199,000
Carbon monoxide	157,000
Other gases	142,000
Petroleum products	130,000
Organic dusts	76,000

The true significance of these widespread substances can only be ascertained by detailed environmental, statistical, and medical studies of a sufficient number of exposed workers. This survey facilitates such studies since it indicates the industries in which those exposures may occur.

Certain other extremely hazardous materials, although encountered less frequently, have always been a great problem to the industrial hygienist. Exposure of Ohio workers to such substances is indicated as follows:

Other solvents	42,000
Lead and its compounds	38,000
Benzol	6,000
Coal tar products	4,500
Chromium and its compounds.....	4,500
Accelerators	3,700
Cyanides	2,400
Cadmium and its compounds.....	1,250
Other miscellaneous chemical substances.....	25,000

According to this survey there are over 125,000 exposures to these extremely toxic materials. The continuation of medical and engineering studies, now in progress, is clearly indicated to insure the safety of individuals in contact with such substances.

Dermatitis constitutes approximately two-thirds of all occupational disease reports on file in the Ohio Department of Health. Almost all of the materials indicated in the survey have sometime been reported as a cause for dermatitis in occupational disease reports received. This survey indicates that there must be at least a million potential dermatitis producing exposures in Ohio industry.

A total of potential exposures of Ohio workers shows that there are approximately one and one-half million exposures among a million individuals, or an average of 1.5 exposures per worker.

The ultimate goal of the Ohio Department of Health is the prevention of occupational diseases by the control of those conditions in industry which affect the health of workers unfavorably. This is dependent on the combined effort of the variously trained personnel in precise physical, chemical, and diagnostic procedures; statistical interpretations; and the formulation of control measures. To this end, it is apparent that the data collected in this survey will be of inestimable value in the future. Potential exposures are indicated in relation to occupation and industry and control measures are listed. These data, collected on an adequate sample of Ohio industry, have been expanded to cover the entire State and will serve as a guide to a permanent industrial hygiene program of the Ohio Department of Health. In a more limited application, the data will facilitate appraisal of occupational disease problems in individual establishments. In addition, the experience gained in surveying has provided a background of familiarity with actual industrial processes which will enhance appreciation of all the factors involved in studies of environmental hygiene.

APPENDIX A

A letter signed by the Director of Health was mailed to each industrial establishment surveyed two weeks prior to the visit by the surveyor. A copy of the contents of the letter follows:

DEAR SIRs:

The State Department of Health is conducting a survey of industries in Ohio. The purpose of the survey is to obtain general information concerning the environmental conditions associated with the various occupations which potentially may have an effect upon the health of workers employed. The findings will be used to appraise occupational disease problems and to construct a permanent industrial health service in Ohio. This survey will cover a representative sample of the industries in the State. The information secured will be used only for the above state purposes and will be treated in such a confidential manner that no portions of individual plant findings will be revealed.

We have selected a random sample of the various industries to be surveyed and your establishment was included. This selection was made without regard to any expected existing conditions that may or may not be detrimental to the health of workers employed, and is therefore not to be interpreted as indicating that we anticipate finding unfavorable health conditions in your plant. On the contrary, we are just as interested in observing conditions which safeguard and promote improvement of the health of workers and no doubt you can demonstrate such facilities. Therefore I can assure you that your establishment was selected without consideration of whether we might find the occupational environment poor, average or good.

A properly identified representative of this Department will call on you within the next week or ten days for the purpose of making this survey. It will be very helpful if you could assign someone for the purpose of giving him the data needed and to accompany him throughout the plant.

Your kind cooperation will be greatly appreciated by this Department.
Very truly yours,

Form 3 was used by the surveyors for recording industrial welfare data for each individual company. Housekeeping data was kept for our own information and is not included in this report.

Form 3.		OHIO INDUSTRIAL HYGIENE SURVEY		Page..... of
		Industrial Health Service Data		Surveyed by.....
Name of Plant.....		Industry Code and No.....		Date.....
County.....		City.....		Location.....
Plant Owner.....		Address.....		
Plant Official.....		Title.....		No. Employees { M..... F..... T.....
Product Manufactured or Service.....				

Safety Provisions		MEDICAL PROVISIONS		Benefits and Records	
Safety Director:	Full Time..... Part Time..... None	Company	Hospital: None	Physician:	Full Time..... Part Time..... On Call..... None
Shop Committee:	Yes..... No.....	First Aid Room:	Yes..... No.....	Nurse:	Full Time..... Part Time..... None
Insurance Service:	Yes..... No.....	First Aid Kit:	Yes..... No.....	P. H..... R. N..... Other	Sickness Record
Other	Yes..... No.....	Trained First Aid Worker:	Yes..... No.....	Remarks:	Yes..... No..... Waiting Period: Days.....
Remarks:	General Comments:		Housekeeping: G..... F..... P.....		
				Remarks:	

Check in Blank Which Applies. State of Ohio, Dept. of Health, Bureau of Occupational Diseases.

Form 4 was used by the surveyors for recording the work room survey data. An individual sheet was made out for each room of each department in the plant surveyed.

Form 4. OHIO INDUSTRIAL HYGIENE SURVEY																
Work Room Survey Data																
Page.....of.....																
Name of Plant.....Location.....Industry Code and No.....																
Department.....Work Room.....																
Informants Name.....Surveyed by.....Date.....																
Occu- pation	Number of Persons			Nature of Job	Gen- eral Venti- lation:	Posi- tive	Nega- tive	Control Measures								Expo- sure Code
	M	F	T					Raw Materials and By-Products	Local Exhaust	Enclosure	Wet Method	Gas Mask	Respirator	Pressure Helmet	Protective Clothing		Other
Total																

State of Ohio, Department of Health, Bureau of Occupational Diseases

Table I is a breakdown of each minor group into the principal types of products manufactured or services rendered. This list does not include all the materials manufactured, but it is sufficiently complete so that any products omitted can be easily placed in the proper classification by correlating with similar products listed.

Table I.

EXAMPLES OF INDUSTRIES INCLUDED UNDER EACH MINOR INDUSTRIAL GROUP

EXTRACTION OF MINERALS

Coal mines

Coal mines.

Other mines

Clay, gypsum.

CHEMICAL AND ALLIED INDUSTRIES

Charcoal and coke

Carbon electrodes, coal tar by-products, coke.

Explosives and ammunition

Cap gun caps, dynamite, fireworks, nitroglycerine, small arms ammunition.

Fertilizer factories

Fertilizer mixing and acidulating, sulfuric acid, tankage.

Paint and varnish

Enamels, lacquers, paint, pigments, stains, varnish.

Petroleum products

Gasolines, greases, lubricating oils, petroleum soaps.

Rayon

Rayon yarn.

Soap factories

Candles, cleaning compounds, cosmetics, glycerine, soaps, stearic acid.

Blackings, cleaners, etc.

Bleaching compounds, cleaning compounds, disinfectants, shoe cleaners, shoe polishes, sweeping compounds, water softeners.

Chemicals (as such)

Acetylene, caustic soda, chlorine, dry ice (CO_2), hydrochloric acid, hydrogen, nitrous oxide, pigments, salt, soda ash, stearic acid (primary product), sulfuric acid, war gases, other miscellaneous chemicals.

Dyestuffs, inks

Dyes, printing inks.

Matches

Matches.

Patent medicine, drugs

Anesthetics, antiseptics, anti-toxins, hog cholera serums, insecticides, ointments, pharmaceuticals, poultry remedies.

Other chemicals

Adhesives, plasters, shingle staining, starch, wood creosoting, other miscellaneous chemical industries.

CIGAR AND TOBACCO FACTORIES**Cigars and tobacco**

All tobacco products.

CLAY, GLASS, AND STONE**Brick and tile**

Brick, drain tile, hot tops, roofing tile, sewer pipe.

Glass factories

Glass wool and fabric, plate glass, safety glass, miscellaneous glass ware.

Glass mirrors

Glass mirrors.

Lime, cement, and artificial stone

Concrete blocks, concrete sewer pipe, concrete vaults, lime, portland cement.

Marble and stone yards

Granite, marble and sandstone cutting and finishing.

Potteries

Chemical stone ware, floor tile, insulators, pottery, table ware (semi-porcelain).

Asphalt and roofing materials

Asphalt, road materials, roof cements and coatings.

Other clay, glass, and stone

Crushed slag, grinding wheels, gypsum products, rock wool, slate products.

CLOTHING**Gloves**

Gloves.

Hats and caps

Men's, women's and children's headwear.

Shirts, collars and cuffs

Shirts, collars and cuffs.

Suits, coats, and overalls

Suits, coats and overalls.

Women's light clothing

Aprons, dresses, pajamas, smocks, suits, underwear, uniforms, etc.

Fur goods

Fur coats, neck pieces.

Other clothing

Garters, play suits, spats, sporting goods, suspenders.

FOOD AND ALLIED INDUSTRIES

Bakeries

Bread, pastries.

Dairy products

Butter, cheese, cream, ice cream, milk.

Candy

Candy, ice cream, peanuts.

Flour and grain

Cereals, corn meal, flour, grain and grain products, live stock feed.

Slaughter and packing houses

Beef, lamb, pork, other meat products.

Ice manufacture

Ice, beverages (incidental).

Liquors, beer, and wine

Liquors, beer and wine.

Soft beverages

Carbonated beverages, mineral water.

Other foods

Canned fruits, coffee roasting, extracts, flavors, jellies, macaroni, mayonnaise, oleomargarine, potato chips, vegetable oils.

IRON AND STEEL

Agricultural implements

Buggies, farm machinery, hand agricultural implements.

Automobile factories

Auto bodies and accessories, auto body repair shops, auto mufflers, auto rims, auto tops, axles, bus and ambulance bodies, fender and body stampings, gas engines, pistons, spark plugs, springs, tractors, transmission and gears, truck and trailer bodies.

Blast furnaces and steel rolling mills

Pig iron, rolled steel, steel castings, steel rails, steel tubes, steel wire.

Car and railroad ships

Cranes, locomotives, steam shovels, steel cars, tank cars.

Ships and boat building

Outboard and other small motor boats, steam ore boats.

Foundries

All companies not otherwise classified engaged in sand molding and casting of iron and steel.

Welding, forging and heat treating

All companies not otherwise classified engaged in fabrication of iron and steel products by heat with the exception of foundries.

Machine shops

All companies not otherwise classified engaged in fabrication of iron and steel products without the use of heat.

METAL INDUSTRIES (Except Iron and Steel)

Brass factories

Brass and bronze foundries and machine shops.

Clock and watch factories

Hall clocks, parking meters, watches.

Copper factories

Bar equipment, copper kettles, copper sheet and tube, copper wire, dairy supplies, stills, weather stripping.

Jewelry

Medals, pins, rings, watch repairing, other custom made jewelry.

Lead and zinc

White lead, smelting.

Tin and enamelware

Bathroom fixtures, enamel frit, kitchenware, tin plating, other enameled products.

Aluminum products

Aluminum patterns, aluminum powder, stamped and spun aluminum kitchenware, miscellaneous aluminum castings.

Electroplating

All types of electroplated products.

Other

Hardware, magnesium castings and powder, metal specialties, registers, screens, spun metal products.

LEATHER

Leather belts and goods

Belts, brief cases, harness, pocket books, pump washers, saddles, sporting goods.

Shoes

Men's, women's and children's shoes.

Tanneries

Leather tanning and finishing.

Trunks and suitcases

Trunks, suitcases.

LUMBER AND FURNITURE

Wood, wicker and upholstered furniture

Cabinets, refrigerators, upholstered furniture, Venetian blinds, wood caskets, wood furniture.

Metal furniture

Cabinets, metal caskets, metal furniture

Other furniture

Bar furniture, cabinets, playground equipment, show cases, store and hotel fixtures.

Planing and milling

Door frames, mouldings, window frames, wood boxes, other miscellaneous lumber mill products.

Other wood working

Apiaries supplies, barrels, baskets, bowling pins, patterns, pianos, organs, wooden heels, other miscellaneous wood working.

PAPER, PRINTING, AND ALLIED INDUSTRIES**Blank books and paper products**

Carbon paper, coated papers, envelopes, gummed paper and labels, paper bags, paper patterns, wall paper, wax paper.

Paper and pulp mills

Paper, straw board.

Paper box factories

Card board and corrugated boxes.

Engraving and photographic work

Blue printing, commercial art and photography, engraving, photostatic work.

Printing and publishing

Job printing, newspaper and magazine publishing.

TEXTILE**Cotton goods**

Belting, burlap bags, rope, rubberized cloth, twine, webbing.

Knit goods

Gloves, hosiery, knit dresses, knit outer wear, sport shirts, sweaters.

Textile dyeing and finishing

Dyeing, shrinking, sponging, waterproofing.

Woolen and worsted

Blankets, robes, shoddy, suits (women's and men's), woolen and worsted cloth.

Embroideries and laces

Embroidery work, lace curtains, other lace products.

Tents and awnings

Awnings, canvas covers, tents, window shades.

Mattresses and bedding

Bed springs, box springs, gliders, mattresses, pillows, studio couches.

Other textiles

Artificial grass, artificial leather, covers, drapes, horse collar pads, oil cloth pennants.

RUBBER**Rubber tires**

Rubber tires.

Other rubber factories

All rubber products other than tires.

MISCELLANEOUS MANUFACTURING INDUSTRIES

Brooms and brushes

Brooms, brushes, sweeping compounds, whisk brooms.

Electrical machinery

Condensers, electric fans, electric motors, electric signs, generator brushes, light bulbs, radios, refrigerators, sweepers, switches, transformers, washing machines, welding machines, x-ray machines.

Instruments

Barometers, dental and medical instruments, surveyors equipment, thermometers.

Gas and electrical fixtures

Flash lights, gas irons, lamp bulbs, lamps, light fixtures.

Storage batteries

Storage batteries and dry cells.

Dental supplies

Dental cement, dental plates, fillings, teeth.

Optical goods

Eye glasses, glass eyes.

Signs (non-electrical)

Commercial signs and bill board displays.

Toys and unclassified novelties

Advertising novelties, embroidery hoops, miscellaneous toys, penny arcades, vending machines.

Other manufacturing plants

Asbestos paper, chalk and wax crayons, decalcomania, fishing tackle, fountain pens, gaskets, golf clubs, hair goods, mops, musical instruments, school supplies, shoe patterns, smoking pipes, stencils, table pads, trusses and supporters.

TRANSPORTATION AND COMMUNICATION

Garages

Auto storage, greasing stations, repair shops.

DOMESTIC AND PERSONAL SERVICE

Laundries

Laundries.

Dry cleaning and dyeing

Dry cleaning and dyeing.

Table II is the major list of materials used in the survey. All the materials listed by the surveyors on the work room data sheets were classified according to this major material list.

Table II.
MAJOR MATERIAL CLASSIFICATION

Accelerators.	Lead and its compounds.
Alcohols, esters, and ethers.	Manganese and its compounds.
Aldehydes.	Medicinals.
Alkaline compounds.	Mercury and its compounds.
Amines.	Mineral acids.
Aniline and its compounds.	Non-silicious dusts (mineral metallic oxides and mineral salts).
Antimony and its compounds.	Oils, fats, and waxes.
Arsenic and its compounds.	Organic acids.
Asbestos dust.	Organic dusts.
Benzol.	Organic solvents (not otherwise specified).
Cadmium and its compounds.	Other chemicals (exposure to many chemical compounds or otherwise not specified organic and inorganic chemicals).
Carbon monoxide.	Other gases.
Chromium and its compounds.	Other metals and their compounds.
Coal dust (anthracite).	Paints and enamels.
Coal dust (bituminous).	Petroleum products (except solvents).
Coal tar products.	Phosphorus and its compounds.
Core gases (decomposition products of core materials formed by the action of heat in foundry processes).	Radium and its compounds.
Cyanides.	Salts (inorganic, technical, and analytical).
Dermatitis producers (not otherwise specified).	Selenium and its compounds.
Dyes.	Silica dust.
Fluorides.	Silicate dusts (including carborundum).
Halogenated hydrocarbons.	Sulfur and alkaline sulfides.
Hydrogen sulfide.	Sulfur dioxide.
Infections.	Temperature change.
Inks.	
Lacquers and varnishes.	

This list indicates examples of substances used or created in industrial environments and includes both materials, harmless from a practical standpoint and recognized industrial poisons. All of these materials were encountered in the survey.

Table III.
EXAMPLE OF PRODUCTS INCLUDED UNDER EACH MAJOR MATERIAL CLASSIFICATION

Accelerators:	Altax (Benzothiazyl disulfide).
A. 19 (Formaldehydeacetaldehydeaniline).	Ammonia formaldehyde.
Age rite resin (Aldol-alpha-naphthylamine).	Anex.
	Aniline.
	Aniline-formaldehyde.

Antox (Para-animophenol).
 Butraldehyde aniline.
 Butylaldehyde.
 Butylamine.
 Butylamine aniline.
 Captax (Mercaptobenzothiazole).
 D. O. T. G. (Di-ortho-tolylguanidine).
 D P. G. (Diphenyl guanidine).
 E. L. Sixty.
 Ethylidene aniline.
 Flectol H (Polymers of 2, 2, 4 trimethyl—1, 2 dihydro-quinoline).
 Guantal (Diphenylguanidine phthalate).
 Hepteen (Heptaldehydeaniline).
 Hexamethylenetetramine.
 M. R. X.
 Methylene-para-toluidine.
 Naphthyl mercaptan.
 Neozone D. (Phenyl-beta-naphthylamine).
 Para-nitrosodimethylaniline.
 Para-phenylenediamine.
 Piperidine.
 Retardex.
 SPDX-A (Lead (beta-toluidenoe-thyl) phenyl dimethyl dithiocarbamate).
 Thermoflex (P. P.: Dimethoxydiphenylamine).
 Thiocarbamates.
 Thiocarbanilide.
 Thionex (Tetramethylthiuram monosulfide).
 Toluidine.
 Triphenylguanidine.
 Tuads (Tetramethylthiuram disulfide).
 Ureka C. (Benzothiazyl-thiobenzoate).
 Voltex.
 Z. 88.

Alcohols, esters and ethers

Amyl acetate.
 Amyl alcohol.
 Butyl acetate.
 Butyl alcohol (butanol).
 Butyl cellosolve.
 Butyl lactate.
 Cellosolve.

Ether (diethyl ether).
 Ethyl acetate.
 Ethyl alcohol (ethanol).
 Ethyl lactate.
 Ethylene oxide.
 Methyl alcohol (methanol).
 Propyl alcohol (iso propanol).
 Solox.
 Wood alcohol.

Aldehydes:

Acrolein.
 Benzaldehyde.
 Crotonaldehyde.
 Formaldehyde.
 Paraformaldehyde.

Alkaline compounds:

Ammonium hydroxide.
 Barium hydroxide.
 Barium oxide.
 Borax.
 Calcium hydroxide.
 Lime (calcium oxide).
 Oakite (trisodium phosphate).
 Potash.
 Potassium carbonate.
 Potassium hydroxide.
 Sal soda.
 Soap.
 Soda ash (sodium carbonate).
 Sodium aluminate.
 Sodium hydroxide.
 Sodium silicate.
 Stripping compounds.
 Wyandotte cleaner.

Amines:

Dimethylamine.
 Diphenylamine.
 Monomethylamine.
 Triethanolamine.

Aniline and its compounds:

Acetanilide.
 Aniline.
 Dimethylaniline.
 Ethyl benzyl aniline.
 Paranitraniline

Antimony and its compounds:

Antimony metal.
 Antimony ore.

Antimony oxide.
Antimony sulfide.
Sodium antimonate.

Arsenic and its compounds:

Arsenous oxide.
Arsenous chloride.
Arsine.
Chloroarsine.
Copper arsenate.
Chlorodiphenylarsine.
Lead arsenate.

Asbestos dust:

Asbestos dust.

Benzol:

Benzol.
Toluol.
Xylol.

Cadmium and its compounds:

Cadmium metal.
Cadium salts.
Cadmium sulfide.

Carbon monoxide:

Carbon monoxide.
Producer gas.

Chromium and its compounds:

Chromates.
Chrome ore.
Chromic acid.
Chromic oxide.
Potassium dichromate.
Sodium dichromate.

Coal dust (anthracite):

Coal dust (anthracite).

Coal dust (bituminous):

Coal dust (bituminous).
Coke.

Coal tar products:

Bakelite.
Carbolic acid (phenol).
Chloro-acetophenone.
Coal tar.
Creosote.
Cresylic acid.
Cumar resin.
Diphenyl oxide.
Lysol.
Naphthalene.

B-Naphthol.
Phenolic resins.
Resorcinol.
Tricresylphosphate.

Core gases:

Core gases.

Cyanides:

Copper cynaide.
Cyanogen.
Potassium cyanide.
Prussic acid (hydrogen cyanide)
Silver cyanide.
Sodium cyanide.
Zinc cyanide.

Dermatitis producers:

Animal glue.
Animal products.
Chocolate.
Dough.
Fruits.
Hides.
Jellies.
Molasses.
Photographic developers.
Sugar.
Syrups.
Vanilla.

Dyes:

Aniline dyes.
Coal tar dyes.
Shoe dyes.
Stains.

Fluorides:

Ammonium bifluoride.
Cryolite.
Fluorspar.
Hydrofluoric acid.
Hydrofluosilicic acid.
Montanine.
Silicon tetrafluoride.
Sodium fluoride.

Halogenated hydrocarbons:

Carbon tetrachloride.
Chlorinated paraffin.
Chlorobutane.
Chloroform.
Dichloroethyl ether.
Ethyl bromide.

Ethyl chloride.
 Ethylene dichloride.
 Freon.
 Halowax.
 Methyl chloride.
 Monochlorobenzene.
 Paradichlorobenzene.
 Permachlor.
 Picrin.
 Trichlorethylene.
 Tryod degreasing solvent.

Hydrogen sulfide:

Hydrogen sulfide.

Infections:

Anthrax.
 Bang's disease.
 Glanders.
 Tetanus.
 Tularemia.

Inks:

Printers ink.
 Stencil ink.

Lacquers and varnishes:

Duco.
 Insulating varnish.
 Pyroxylin.
 Shellac.
 Water proofing lacquers.

Lead and its compounds:

Lead alloys.
 Lead metal.
 Lead paint.
 Lead salts.
 Litharge.
 Read lead.
 Tetra ethyl lead.
 White lead.

Manganese and its compounds:

Ferro manganese.
 Manganese acetate.
 Manganese borate.
 Manganese dioxide.
 Manganese ore.
 Manganese spiegel.
 Pyrolusite.
 Resinate of manganese.

Medicinals:

Alkaloids.
 Iodine.

Pharmaceuticals.
 Serums.

Mercury and its compounds:

Corrosive sublimate (mercury bichloride).
 Fulminate of mercury.
 Mercury vapor.

Mineral acids:

Hydrochloric acid.
 Nitric acid.
 Phosphoric acid.
 Sulfuric acid.

Non-silicious dusts:

Aloxite.
 Alundum.
 Calcium carbide.
 Corundum.
 Cyanamide.
 Emery.
 Fuller's earth.
 Gypsum.
 Limestone.
 Magnesite.
 Magnesite.
 Phosphate rock.
 Selenite.
 Titanium oxide.
 Titanox.

Oils, fats, and waxes:

Bean oil.
 Beeswax.
 Carnauba wax.
 Castor oil.
 Ceresine wax.
 China wood oil.
 Citronella oil.
 Coconut oil.
 Core oil.
 Cotton seed oil.
 Fish oil.
 Lanolin.
 Lard.
 Lavender oil.
 Linseed oil.
 Olive oil.
 Palm oil.
 Perilla oil.
 Pine oil.
 Red oil.

Shoe polishes.
Soy bean oil.
Tallow.
White oil.

Organic acids:

Acetic acid.
Benzoic acid.
Citric acid.
Formic acid.
Gallic acid.
Lactic acid.
Lauric acid.
Oleic acid.
Oxalic acid.
Phthalic acid.
Salicylic acid.
Stearic acid.
Sulfanilic acid.
Tannic acid.
Tartaric acid.

Organic dusts:

Alfalfa.
Cellulose acetate.
Charcoal.
Cotton.
Dextrin.
Feathers.
Felt.
Fish meal.
Flax.
Flour.
Fur.
Grain products.
Graphite.
Gum Tragacanth.
Hair.
Hemp.
Jute.
Kapok.
Lampblack.
Leather dust.
Mustard.
Nitrocellulose.
Nut meal.
Paper.
Plumbago.
Pomace.
Pyrethrum flowers.
Resin.
Rosin.

Rubber.
Sawdust.
Sisal.
Spices.
Starch.
Straw.
Tankage.
Tobacco dust.
Urea.
Wool.
Yeast.

Organic solvents:

Acetone (dimethylketone).
Carbitol.
Carbon disulfide.
Cleaners solvents (n. o. s.).
Cyclohexanol
Dipentene.
Energine.
Ethylene glycol.
Gasoline.
Glycerol.
Kerosene.
Leather cement.
Naphtha.
Petroleum ether.
Prestone.
Rubber cement.
Safety glass solvent.
Stoddards solvent.
Sulfur monochloride.
Trimethylene glycol.
Turpentine.
Varneline.

Other chemicals:

Chemicals, organic and inorganic
(exposure to many chemical com-
pounds or otherwise not specified
organic chemicals).

Other gases:

Ammonia.
Bromine.
Carbon dioxide.
Chlorine.
Cyclopropane.
Ethylene.
Hydrogen.
Natural gas.
Oxides of nitrogen.

Ozone.
Propylene oxide.

Other metals:

Aluminum alloys.
Barium salts.
Brass dust.
Burnt umber.
Cobalt and its compounds.
Copper and its compounds.
Gold.
Iridium and its compounds.
Iron dust.
Iron oxide.
Magnesium alloys.
Nickel and its compounds.
Palladium and its compounds.
Platinum and its compounds.
Rouge.
Silver and its compounds.
Strontium salts.
Tin and its compounds.
Tungsten and its compounds.
Uranium and its compounds.
Vanadium and its compounds.
Zinc and its compounds.
Zirconium and its compounds.

Paints and enamels:

Ceramic paints.
Decals.
Enamels.
Japans.
Paints.
Putty.

Petroleum products:

Asphalt.
Cutting oils.
Gilsonite.
Greases.
Lubricants.
Mineral oil.
Ozocerite.
Paraffin.
Pitch.
Quenching oil.
Tar.

Phosphorus and its compounds:

Phosphine.
Phosphorus.
Phosphorus pentoxide.

Radium and its compounds:

Salts:

Alum.
Aluminum sulfate.
Ammonium chloride (sal ammoniac).
Ammonium nitrate.
Ammonium sulfate.
Calcium chloride.
Calcium sulfate.
Hypo.
Magnesium sulfate.
Potassium bromide.
Potassium chlorate.
Potassium chloride.
Potassium nitrate.
Potassium perchlorate.
Sodium bisulfite.
Sodium bromide.
Sodium chloride.
Sodium hypochlorite.
Sodium hydrogen sulfate.
Sodium nitrate.
Sodium sulfate.

Selenium and its compounds:

Selenium compounds.

Silicia dust:

Agate.
Chalcedony.
Cristobalite.
Diatomaceous earth.
Flint.
Ganister.
Granite.
Infusorial earth.
Jasper.
Molders sand.
Onyx.
Opal.
Quartz.
Sand.
Silica.
Tridymite.
Tripoli.

Silicate dusts:

Ashes.
Carborundum.
Clay.
Cyanite.
Feldspar.

Fire clay.
Glass.
Mica.
Mineral wool.
Molders sand.
Portland cement.
Pumice.
Rock wool.
Sillimanite.
Slag.
Slate.
Soap stone.

Talc.

Sulfur:

Ammonium sulfide.
Calcium sulfide.
Sodium sulfide.
Sulfur.

Sulfur dioxide:

Sulfur dioxide.

Temperature change:

Temperature change.

Table IV is an alphabetical list of the materials found in the survey with their major material classification.

Table IV.

MATERIAL CLASSIFICATION (Alphabetical List)

Material	Classification
A. 19.....	Accelerators.
Acetanilide	Aniline and its compounds.
Acetic acid.....	Organic acids.
Acetone	Organic solvents.
Acrolein	Aldehydes.
Agate	Silica dust.
Age rite resin.....	Accelerators.
Alfalfa	Organic dusts.
Alkaloids	Medicinals.
Aloxite	Non-silicious dusts.
Altax	Accelerators.
Alum	Salts.
Aluminum alloys.....	Other metals.
Aluminum sulfate.....	Salts.
Alundum	Non-silicious dusts.
Ammonia	Other gases.
Ammonia formaldehyde.....	Accelerators.
Ammonium bifluoride.....	Fluorides.
Ammonium chloride.....	Salts.
Ammonium hydroxide.....	Alkaline compounds.
Ammonium nitrate.....	Salts.
Ammonium sulfate.....	Salts.
Ammonium sulfide.....	Sulfur.
Amyl acetate.....	Alcohols, esters, and ethers.
Amyl alcohol.....	Alcohols, esters, and ethers.
Anex	Accelerators.
Aniline	Accelerators.
Aniline	Aniline and its compounds.
Aniline dyes.....	Dyes.
Aniline-formaldehyde	Accelerators.
Animal glue.....	Dermatitis producers.

Animal products.....	Dermatitis producers.
Anthrax	Infections.
Antimony metal.....	Antimony and its compounds.
Antimony ore.....	Antimony and its compounds.
Antimony oxide.....	Antimony and its compounds.
Antimony sulfide.....	Antimony and its compounds.
Antox	Accelerators.
Arsenous oxide.....	Arsenic and its compounds.
Arsenous chloride.....	Arsenic and its compounds.
Arsine	Arsenic and its compounds.
Asbestos dust.....	Asbestos dusts.
Ashes	Silicate dusts.
Asphalt	Petroleum products.
Bakelite	Coal tar products.
Bang's disease.....	Infections.
Barium hydroxide.....	Alkaline compounds.
Barium oxide.....	Alkaline compounds.
Barium salts.....	Other metals.
Bean oil.....	Oils, fats, and waxes.
Beeswax	Oils, fats, and waxes.
Benzaldehyde	Aldehydes.
Benzoic acid.....	Organic acids.
Benzol	Benzol.
Borax	Alkaline compounds.
Brass dust.....	Other metals.
Bromine	Other gases.
Burnt umber.....	Other metals.
Butanol	Alcohols, esters, and ethers.
Butraldehyde aniline.....	Accelerators.
Butyl acetate.....	Alcohols, esters, and ethers.
Butyl alcohol.....	Alcohols, esters, and ethers.
Butylaldehyde	Accelerators.
Butylamine	Accelerators.
Butylamine aniline.....	Accelerators.
Butyl cellosolve.....	Alcohols, esters, and ethers.
Butyl lactate.....	Alcohols, esters, and ethers.
Cadmium metal.....	Cadium and its compounds.
Cadmium salts.....	Cadium and its compounds.
Cadmium sulfide.....	Cadium and its compounds.
Calcium carbide.....	Non-silicious dusts.
Calcium chloride.....	Salts.
Calcium hydroxide.....	Alkaline compounds.
Calcium oxide.....	Alkaline compounds.
Calcium sulfate.....	Salts.
Calcium sulfide.....	Sulfur.
Captax	Accelerators.
Carbitol	Organic solvents.
Carbolic acid.....	Coal tar products.
Carbon disulfide.....	Organic solvents.
Carbon dioxide.....	Other gases.
Carbon monoxide.....	Carbon monoxide.

Carbon tetrachloride.....	Halogenated hydrocarbons.
Carborundum	Silicate dusts.
Carnauba wax.....	Oils, fats, and waxes.
Castor oil.....	Oils, fats, and waxes.
Cellulose acetate.....	Organic dusts.
Cellosolve	Alcohols, esters, and ethers.
Ceramic paints.....	Paints and enamels.
Ceresine wax.....	Oils, fats, and waxes.
Chalcedony	Silica dust.
Charcoal	Organic dusts.
China wood oil.....	Oils, fats, and waxes.
Chlorine	Other gases.
Chlorinated paraffin.....	Halogenated hydrocarbons.
Chloro-acetophenone	Coal tar products.
Chloroarsine	Arsenic and its compounds.
Chlorobutane	Halogenated hydrocarbons.
Chlorodiphenylarsine	Arsenic and its compounds.
Chloroform	Halogenated hydrocarbons.
Chocolate	Dermatitis producers.
Chromates	Chromium and its compounds.
Chrome ore.....	Chromium and its compounds.
Chromic acid.....	Chromium and its compounds.
Chromic oxide.....	Chromium and its compounds.
Citric acid.....	Organic acids.
Citronella oil.....	Oils, fats, and waxes.
Clay	Silicate dusts.
Cleaners solvents (n.o.s.).....	Organic solvents.
Coal dust (anthracite).....	Coal dust (anthracite).
Coal dust (bituminous).....	Coal dust (bituminous).
Coal tar.....	Coal tar products.
Coal tar dyes.....	Dyes.
Cobalt and its compounds.....	Other metals.
Coconut oil.....	Oils, fats, and waxes.
Coke	Coal dust (bituminous).
Copper arsenate.....	Arsenic and its compounds.
Copper and its compounds.....	Other metals.
Copper cyanide.....	Cyanides.
Core gases.....	Core gases.
Core oil.....	Oils, fats, and waxes.
Corrosive sublimate.....	Mercury and its compounds.
Corundum	Non-silicious dusts.
Cotton	Organic dusts.
Cottonseed oil.....	Oils, fats, and waxes.
Cresote	Coal tar products.
Cresylic acid.....	Coal tar products.
Cristobalite	Silica dust.
Crotonaldehyde	Aldehydes.
Cryolite	Fluorides.
Cumar resin.....	Coal tar products.
Cutting oils.....	Petroleum products.
Cyanamide	Non-silicious dusts.

Cyanite	Silicate dusts.
Cyanogen	Cyanides.
Cyclohexanol	Organic solvents.
Cyclopropane	Other gases.
Decals	Paints and enamels.
Dextrin	Organic dusts.
Diatomaceous earth.....	Silica dust.
Dichloroethyl ether.....	Halogenated hydrocarbons.
Diethyl ether.....	Alcohols, esters, and ethers.
Dimethylamine	Amines.
Dimethylaniline	Aniline and its compounds.
Dimethylketone	Organic solvents.
Di-ortho-tolylguanidine	Accelerators.
Dipentene	Organic solvents.
Diphenylamine	Amines.
Diphenylguanidine	Accelerators.
Diphenyl oxide.....	Coal tar products.
D. O. T. G.....	Accelerators.
Dough	Dermatitis producers.
D. P. G.....	Accelerators.
Duco	Lacquers and varnishes.
E. L. Sixty.....	Accelerators.
Emery	Non-silicious dusts.
Enamels	Paints and enamels.
Energine	Organic solvents.
Ethanol	Alcohols, esters, and ethers.
Ether	Alcohols, esters, and ethers.
Ethyl acetate.....	Alcohols, esters, and ethers.
Ethyl alcohol.....	Alcohols, esters, and ethers.
Ethyl benzyl aniline.....	Aniline and its compounds.
Ethyl bromide.....	Halogenated hydrocarbons.
Ethyl chloride.....	Halogenated hydrocarbons.
Ethylidene aniline.....	Accelerators.
Ethyl lactate.....	Alcohols, esters, and ethers.
Ethylene	Other gases.
Ethylene dichloride.....	Halogenated hydrocarbons.
Ethylene glycol.....	Organic solvents.
Ethylene oxide.....	Alcohols, esters, and ethers.
Feathers	Organic dusts.
Feldspar	Silicate dusts.
Felt	Organic dusts.
Ferro manganese.....	Manganese and its compounds.
Fire clay.....	Silicate dusts.
Fish meal.....	Organic dusts.
Fish oil.....	Oils, fats, and waxes.
Flax	Organic dusts.
Flectol H.....	Accelerators.
Flint	Silica dust.
Flour	Organic dusts.
Fluorspar	Fluorides.
Formaldehyde	Aldehydes.

Formic acid.....	Organic acids.
Freon	Halogenated hydrocarbons.
Fruits	Dermatitis producers.
Fuller's earth.....	Non-silicious dusts.
Fulminate of mercury.....	Mercury and its compounds.
Fur	Organic dusts.
Gallic acid.....	Organic acids.
Ganister	Silica dust.
Gasoline	Organic solvents.
Gilsonite	Petroleum products.
Glanders	Infections.
Glass	Silicate dusts.
Glycerol	Organic solvents.
Gold	Other metals.
Grain products.....	Organic dusts.
Granite	Silica dust.
Graphite	Organic dusts.
Greases	Petroleum products.
Guantal	Accelerators.
Gum tragacanth.....	Organic dusts.
Gypsum	Non-silicious dusts.
Hair	Organic dusts.
Halowax	Halogenated hydrocarbons.
Hemp	Organic dusts.
Hepteen	Accelerators.
Hexamethylenetetramine	Accelerators.
Hides	Dermatitis producers.
Hydrochloric acid.....	Mineral acids.
Hydrofluoric acid.....	Fluorides.
Hydrofluosilicic acid.....	Fluorides.
Hydrogen	Other gases.
Hydrogen cyanide.....	Cyanides.
Hydrogen sulfide.....	Hydrogen sulfide.
Hypo	Salts.
Infusorial earth.....	Silica dust.
Insulating varnish.....	Lacquers and varnishes.
Iodine	Medicinals.
Iridium and its compounds.....	Other metals.
Iron dust.....	Other metals.
Iron oxide.....	Other metals.
Isopropanol	Alcohols, esters, and ethers.
Japans	Paints and enamels.
Jasper	Silica dust.
Jellies	Dermatitis producers.
Jute	Organic dusts.
Kapok	Organic dusts.
Kerosene	Organic solvents.
Lactic acid.....	Organic acids.
Lampblack	Organic dusts.
Lanolin	Oils, fats, and waxes.
Lard	Oils, fats, and waxes.

Lauric acid.....	Organic acids.
Lavender oil.....	Oils, fats, and waxes.
Lead alloys.....	Lead and its compounds.
Lead arsenate.....	Arsenic and its compounds.
Lead metal.....	Lead and its compounds.
Lead paint.....	Lead and its compounds.
Lead salts.....	Lead and its compounds.
Leather cement.....	Organic solvents.
Leather dust.....	Organic dusts.
Lime	Alkaline compounds.
Limestone	Non-silicious dusts.
Linseed oil.....	Oils, fats, and waxes.
Litharge	Lead and its compounds.
Lubricants	Petroleum products.
Lysol	Coal tar products.
Magnesia	Non-silicious dusts.
Magnesite	Non-silicious dusts.
Magnesium alloys.....	Other metals.
Magnesium sulfate.....	Salts.
Manganese acetate.....	Manganese and its compounds.
Manganese borate.....	Manganese and its compounds.
Manganese dioxide.....	Manganese and its compounds.
Manganese ore.....	Manganese and its compounds.
Manganese spiegel.....	Manganese and its compounds.
Mercaptobenzathiazole	Accelerators.
Mercury bichloride.....	Mercury and its compounds.
Mercury vapor.....	Mercury and its compounds.
Methanol	Alcohols, esters, and ethers.
Methyl alcohol.....	Alcohols, esters, and ethers.
Methylene-para-toluidine	Accelerators.
Methyl chloride.....	Halogenated hydrocarbons.
Mica	Silicate dusts.
Mineral oil.....	Petroleum products.
Mineral wool.....	Silicate dusts.
Molasses	Dermatitis producers.
Molders sand.....	Silica dust.
Molders sand.....	Silicate dusts.
Monochlorobenzene	Halogenated hydrocarbons.
Monomethylamine	Amines.
Montanine	Fluorides.
M.R.X.	Accelerators.
Mustard	Organic dusts.
Naphtha	Organic solvents.
Naphthalene	Coal tar products.
B. Naphthol.....	Coal tar products.
Naphthyl mercaptan.....	Accelerators.
Natural gas.....	Other gases.
Neozone D.....	Accelerators.
Nickel and its compounds.....	Other metals.
Nitric acid.....	Mineral acids.
Nitrocellulose	Organic dusts.

Nut meal.....	Organic dusts.
Oakite	Alkaline compounds.
Oleic acid.....	Organic acids.
Olive oil.....	Oils, fats, and waxes.
Onyx	Silica dust.
Opal	Silica dust.
Oxalic acid.....	Organic acids.
Oxides of nitrogen.....	Other gases.
Ozocerite	Petroleum products.
Ozone	Other gases.
Paints	Paints and enamels.
Palladium and its compounds.....	Other metals.
Palm oil.....	Oils, fats, and waxes.
Paper	Organic dusts.
Paradichlorobenzene	Halogenated hydrocarbons.
Paraffin	Petroleum products.
Paraformaldehyde	Aldehydes.
Para-nitraniline	Aniline and its compounds.
Para-nitrosodimethylaniline	Accelerators.
Para-phenylenediamine	Accelerators.
Perilla oil.....	Oils, fats, and waxes.
Permachlor	Halogenated hydrocarbons.
Petroleum ether.....	Organic solvents.
Pharmaceuticals	Medicinals.
Phenol	Coal tar products.
Phenolic resins.....	Coal tar products.
Phosphate rock.....	Non-silicious dusts.
Phosphine	Phosphorus and its compounds.
Phosphoric acid.....	Mineral acids.
Phosphorus	Phosphorus and its compounds.
Phosphorus pentoxide.....	Phosphorus and its compounds.
Photographic developers.....	Dermatitis producers.
Phthalic acid.....	Organic acids.
Picrin	Halogenated hydrocarbons.
Pine oil.....	Oils, fats, and waxes.
Piperidine	Accelerators.
Pitch	Petroleum products.
Platinum and its compounds.....	Other metals.
Plumbago	Organic dusts
Pomace	Organic dusts.
Portland cement.....	Silicate dusts.
Potash	Alkaline compounds.
Potassium bromide.....	Salts.
Potassium carbonate.....	Alkaline compounds.
Potassium chlorate.....	Salts.
Potassium chloride.....	Salts.
Potassium cyanide.....	Cyanides.
Potassium dichromate.....	Chromium and its compounds.
Potassium hydroxide.....	Alkaline compounds.
Potassium nitrate.....	Salts.
Potassium perchlorate.....	Salts.

Prestone	Organic solvents.
Printers ink.....	Inks.
Producer gas.....	Carbon monoxide.
Propyl alcohol.....	Alcohols, esters, and ethers.
Propylene oxide.....	Other gases.
Prussic acid.....	Cyanides.
Pumice	Silicate dusts.
Putty	Paints and enamels.
Pyrethrum flowers.....	Organic dusts.
Pyrolusite	Manganese and its compounds.
Pyroxylin	Lacquers and varnishes.
Quartz	Silica dust.
Quenching oil.....	Petroleum products.
Red lead.....	Lead and its compounds.
Red oil.....	Oils, fats, and waxes.
Resin	Organic dusts.
Resinate of manganese.....	Manganese and its compounds.
Resorcinol	Coal tar products.
Retardex	Accelerators.
Rock wool.....	Silicate dusts.
Rosin	Organic dusts.
Rouge	Other metals.
Rubber	Organic dusts.
Rubber cement.....	Organic solvents.
Safety glass solvent.....	Organic solvents.
Sal ammoniac.....	Salts.
Sal soda.....	Alkaline compounds.
Salicylic acid.....	Organic acids.
Sand	Silica dust.
Sawdust	Organic dusts.
Selenite	Non-silicious dusts.
Selenium compounds.....	Selenium and its compounds.
Serums	Medicinals.
Shellac	Lacquers and varnishes.
Shoe dyes	Dyes.
Shoe polishes.....	Oils, fats, and waxes.
Silica	Silica dust.
Silicon tetrafluoride.....	Fluorides.
Sillimanite	Silicate dusts.
Sisal	Organic dusts.
Silver and its compounds.....	Other metals.
Silver cyanide.....	Cyanides.
Slag	Silicate dusts.
Slate	Silicate dusts.
Soap	Alkaline compounds.
Soap stone.....	Silicate dusts.
Soda ash.....	Alkaline compounds.
Sodium aluminate.....	Alkaline compounds.
Sodium antimonate.....	Antimony and its compounds.
Sodium bisulfite.....	Salts.
Sodium bromide.....	Salts.

Sodium carbonate.....	Alkaline compounds.
Sodium chloride.....	Salts.
Sodium cyanide.....	Cyanides.
Sodium dichromate.....	Chromium and its compounds.
Sodium fluoride.....	Fluorides.
Sodium hydrogen sulfate.....	Salts.
Sodium hydroxide.....	Alkaline compounds.
Sodium hypochlorite.....	Salts.
Sodium nitrate.....	Salts.
Sodium perborate.....	Alkaline compounds.
Sodium silicate.....	Alkaline compounds.
Sodium sulfate.....	Salts.
Sodium sulfide.....	Sulfur.
Solox	Alcohols, esters, and ethers.
Soy bean oil.....	Oils, fats, and waxes.
SPDX-A	Accelerators.
Spices	Organic dusts.
Stains	Dyes.
Starch	Organic dusts.
Stearic acid.....	Organic acids.
Stencil ink.....	Inks.
Stoddards solvent.....	Organic solvents.
Straw	Organic dusts.
Stripping compounds.....	Alkaline compounds.
Strontium salts.....	Other metals.
Sugar	Dermatitis producers.
Sulfanilic acid.....	Organic acids.
Sulfur	Sulfur.
Sulfur dioxide.....	Sulfur dioxide.
Sulfur monochloride.....	Organic solvents.
Sulfuric acid.....	Mineral acids.
Syrups	Dermatitis producers.
Talc	Silicate dusts.
Tallow	Oils, fats, and waxes.
Tankage	Organic dusts.
Tannic acid.....	Organic acids.
Tar	Petroleum products.
Tartaric acid.....	Organic acids.
Temperature change.....	Temperature change.
Tetanus	Infections.
Tetra ethyl lead.....	Lead and its compounds.
Tetramethylthiuram disulfide.....	Accelerators.
Tetramethylthiuram monosulfide.....	Accelerators.
Thermoflex	Accelerators.
Thiocarbamates	Accelerators.
Thiocarbanilide	Accelerators.
Thionex	Accelerators.
Tin and its compounds.....	Other metals.
Titanium oxide.....	Non-silicious dusts.
Titanox	Non-silicious dusts.
Tobacco dust.....	Organic dusts.

Toluidine	Accelerators.
Toluol	Benzol.
Trichloroethylene	Halogenated hydrocarbons.
Tricresylphosphate	Coal tar products.
Tridymite	Silica dust.
Triethanolamine	Amines.
Trimethylene glycol.....	Organic solvents.
Triphenylguanidine	Accelerators.
Trisodium phosphate.....	Alkaline compounds
Tripoli	Silica dust.
Tryod degreasing solvent.....	Halogenated hydrocarbons.
Uranium and its compounds.....	Other metals.
Urea	Organic dusts.
Ureka C.....	Accelerators.
Vanadium and its compounds.....	Other metals.
Vanilla	Dermatitis producers.
Varneline	Organic solvents.
Voltex	Accelerators.
Water proofing lacquers.....	Lacquers and varnishes.
White lead.....	Lead and its compounds.
White oil.....	Oils, fats, and waxes.
Wood alcohol.....	Alcohols, esters, and ethers.
Wool	Organic dusts.
Wyandotte cleaner.....	Alkaline compounds.
Xylol	Benzol.
Yeast	Organic dusts.
Z.88	Accelerators.
Zinc and its compounds.....	Other metals.
Zinc cyanide.....	Cyanides.
Zirconium and its compounds.....	Other metals.

Table V is a list of occupations found in each minor industrial group. The major occupations of each group listed are found in Tables 11 to 116. Occupations similar to or the same as those indicated in the tables were combined with the major occupations for listing in the occupational exposure tables. These combined occupations are indicated here in parenthesis following the major occupation under which they were listed in the occupational exposure tables. Occupations which did not have any direct relation to the group and those which constituted a very small proportion of the workers in that group are placed under "others". As an example "butchers" and "cooks" do not have any direct relation to the dairy industry and since they are few in number they are placed under "others". All repairmen, boiler-room men, janitors, and workers charged with the upkeep of the plant are listed under "maintenance."

Table V.

OCCUPATIONS ENCOUNTERED IN EACH MINOR INDUSTRIAL GROUP

EXTRACTION OF MINERALS

Coal Mines:

Brakemen (riders), car droppers, clean up men, clerks, drillers (rock men), dumpers, laborers, loaders, motor men, mule drivers, operators, pickers (table men), pick miners, pumpers, recovery men, shooters, supply men, supervisors (foremen, superintendents), timber men (brattice men), tippie men, trackmen, truck drivers, other (bottom men, chemists, cutters, draftsmen, driers, filterers, pitmen,, safety directors, surveyors, trimmers, weigh masters), maintenance (blacksmiths, carpenters, electricians, engineers, firemen, lamp men, machinists, mechanics, oilers, painters, repairmen, welders, wiremen).

Other mines

Chargers, crushers, drill men, hoist men, kettle men, laborers, loaders, operators, puddlers, roof men, shooters, stone pickers, supervisors (foremen, superintendents), take off men, track men, truck drivers, other (bundle men, clerks, edge men, gin hands, kiln men, mixers, molders, paper hangers, rock driers, screen room men, tapen men), maintenance (coal passers, electricians, engineers, firemen, machinists, mechanics, millwrights, repairmen).

CHEMICAL AND ALLIED INDUSTRIES

Charcoal and coke

Chemists, coke handlers (unloaders), dippers, engineers (pump tenders), finishers, inspectors (weighers), laborers, mechanics (repairmen), operators, oven men, packers, sealers, supervisors, train crew.

Explosives and ammunition

Coaters, explosive makers (powder makers), fillers, finishers, laborers, mixers, operators, packers (box makers, wrappers), platers (washers), pressmen, supervisors, foremen, technical men (ballistic experts, chemists), maintenance (adjusters, blacksmiths, engineers, firemen, janitors, machinists, salvagemen, sweepers).

Fertilizer factories

Acid makers (chambermen, relief men), acidulators (carboy men), baggers (hangers, sewers), burners, car men, cookers (greasemen, melters, tallow men, tank-age men), extractors (pressmen), fertilizer men (dolomite men, potash men, screen men, sulfate ammonia men), grinders, laborers (utility men), lead burners, loaders, mill men, mixers, operators, packers, pitmen (den men, drillers, dynamiters, elevator men, excavators, holemen), receivers (store room men), shippers (clerks), skimmers (butchers), supervisors (foremen, managers, process men, superintendents), truckers (cranemen, rollers, tractor men, wheelers), weighers (checkers), other (chemists, printers, sample men), maintenance (carpenters, electricians, engineers, firemen, mechanics, millwrights, oilers, repairmen, sweepers, watchmen).

Paint and varnish

Cleaners, fillers, grinders (millmen), inspectors, laborers (floormen, utility men), mixers (paint makers), operators (tenders), painters (decorators, dippers, finishers, sprayers, stylists), pressmen, printers (apprentices, cutters, feeders, typesetters), pumpers (filterers), receivers, shaders (blenders, color matchers, formulators, tinters), shippers (assemblers, clerks, labelers, packers, stencil markers, stockmen, storage men), supervisors (foremen, managers, superintendents), technical men (chemists, experimental men, laboratory assistants, sample men, testers), thinners, truckers (drivers), varnish makers (gum sorters, lacquer makers, melters, varnish cookers, varnish reducers), weighers (scale men), other (coopers, dish washers, driers, oil handlers, polishers, putty makers, salad girls, soap makers, stain makers, stainers, strippers), maintenance (carpenters, engineers, firemen, janitors, machinists, mechanics, mill dressers, mill wrights, oilers, pasters, pipe fitters, porters, repairmen, service men, stampers, stone masons, twister, watchmen).

Petroleum products

Boiler makers, car loaders, cleaners (washers), compounders, grease makers (wax makers), laborers, mixers, operators, packers (fillers, warehouse men), pipe fitters (insulators, pipe cutters), refiners, still men (heaters, housemen, pumpers, tankmen, topmen), supervisors (foremen), technical men (chemists, testers), treaters, truck drivers, other (buffers, cooks, sprayers), maintenance (blacksmiths, carpenters, cranemen, electricians, engineers, firemen, janitors, linemen, machinists, mechanics, painters, repairmen, salvagers, welders).

Rayon

Bleachers, chemists, coners, floormen, foremen, laborers, mechanics, spinners, tank men, maintenance (firemen, millwrights).

Soap factories

Assemblers (benchmen), bakers, cleaners (washers), compounders (wax makers), cookers, fillers, glycerine makers (refiners), laborers (loaders, utility men), material handlers, mixers (crutchers), operators, packers (wrappers), pressmen (plodders), printers, pumpers, receivers (clerks), soap makers (soap manufacturers), stampers (cutters), stock keepers, supervisors (foremen, superintendents), technical men (analysts, chemists, samplers), truckers, other (acidulators, coopers, draw off men, feeders, weighers), maintenance (blacksmiths, carpenters, engineers, finishers, firemen, machinists, millwrights, oilers, painters, pipe fitters, porters, repairmen, tinners, watchmen, welders).

Blackings, cleaners, etc.

Chemists, compounders, fillers (belt men, bottlers, feeders, lid men), laborers

(utility men), mixers, operators, packers (clerks, labelers, pasters, printers, shippers), supervisors (superintendents), maintenance (carpenters, firemen, watchmen).

Chemicals (as such)

Bricklayers (clay workers), brine tenders (bromine workers, tank men, tower tenders), catalyzers, coopers, compressors, dryers, floormen, fillers (belt men, lid men), finishers (buffers, grinders, sanders), furnace men, generator chargers, laborers (shovelers), mixers, molders, operators, packers (wrappers), pan men (autoclavers, evaporator men, powder men, sorters), platers, pressmen, printers, process men, pumpers, shippers (clerks, loaders, stock men, warehouse men), supervisors (foremen, inspectors, superintendents), technical men (chemists, laboratory men, research men, testers), truckers, other (assemblers, burners, chippers, cleaners, color matchers, cooks, kettle men, melters, refiners, soap makers, steamers, tube makers), maintenance (ashmen, blacksmiths, carpenters, electricians, engineers, firemen, janitors, machinists, mechanics, millwrights, oilers, painters, pipe fitters, repairmen, tinnners, tool and die makers, watchmen, water softeners, welders).

Dyestuffs, inks

Compounders, cooks, coopers, grinders, ice makers, laborers, matchers, millers, mixers, operators, pressmen, supervisors (foremen, superintendents), technical men (chemists, draftsmen), other (cleaners, clerks, nurses, truckers), maintenance (carpenters, engineers, janitors, pipe fitters).

Matches

Barkers, box makers, chemists, gaugers, laborers, mixers, operators, painters, panners, packers (wrappers), pressmen, supervisors, testers, other (dryers, grinders, stainers, stockmen), maintenance (machinists, truckers, welders).

Patent medicines, drugs

Assemblers (set up men), chemists, compounders, distillers, fillers (bottlers, cappers), grinders, inspectors, labelers, laborers, mixers, operators (attendants), packers (clerks, stock keepers, wrappers), pharmacists, preparers (cream makers), printers (cutters, pressmen), sealers (cementers), supervisors (executives, factory managers, foreladies, foremen, managers, office workers, superintendents), tablet makers (capsule makers, tablet coaters, tablet room keepers), technicians (parasitologists), weighers, other (bottle washers, dryers, leather workers, melters, vulcanizers), maintenance (boiler men, carpenters, engineers, firemen, mechanics, painters, porters, sand blasters, tinnners, watchmen).

Other chemicals

Chemists, dippers, drivers (doormen), fillers, formers, grinders (millers), kettlemen (refiners), labelers, laborers (utility men), loaders (catchers), mixers (paste mixers), operators, packers (sackers, wrappers), polishers, pressers (molders), pressmen, printers, shippers (clerks, store keepers), strippers, supervisors (foremen, superintendents), treaters (stillmen, borers), washers (cleaners), other (feeders, ink makers, steepers), maintenance (brakemen, engineers, firemen, janitors, machinists, mechanics, millwrights, repairmen, sweepers).

CIGAR AND TOBACCO FACTORIES

Cigars and tobacco

Cigar makers, cutters, dippers, feeders, labelers, laborers, mixers (cookers), operators (machine operators), oven tenders, packers (bulkroom men), sorters, tippers, maintenance (electricians, engineers, firemen, mechanics, millwrights, sharpen-

ers), bench makers, bookkeepers, breakers, cartoners, carriers, casers, clerks, coopers, dryers, executives, fillers, floorladies, floormen, fluffing men, foremen, graders, inspectors, porters, rollers, sprayers, stampers, steamers, strippers, superintendents, weighers.

CLAY, GLASS, AND STONE

Brick and tile

Brick layers (brick masons, patchers), drillers (augermen), drivers (brakemen, haulers, mule drivers, truckers), drawers (pullers, shaders, sorters), firemen (ashmen, attendants, burners, kiln tenders), finishers (drummers, patch crewmen, rounders, spongers, stampers, trimmers), glazers (sprayers), hackers (breakoff men, carriers, cut off men, off bearers, pick off men, table men, take off men), kiln setters (fillers, kiln loaders, kiln men, placers, ringmen, set gang men, setters), laborers (clean up men, gin hands, track men, yard men), loaders (unloaders), miners (dynamiters, jack hammer men, shooters, timbermen), molders (branchers, casters), operators (auger men, brick makers, cutters, extruders, machine men), pan men (chargers, crushers, dilly men, dump men, feeders, grinders, mixers), puggers (drum men, millers, millmen, mud makers, mud panmen, pug millers, temperers), pressmen, pitmen (clay diggers, clay winners, donkey drivers, shovel operators), sealers (door builders, plastermen), screen men (bin men), shippers (clerks, packers, samplemen, storage men), supervisors (ceramic engineers, foremen, superintendents, technical men, watchers), transfer men (carriers, truckers), wheelers (burnt gang men, conveyors, jackasses, pushers, truckers), other (benchmen, brushers, checkers, chemists, inspectors, pattern makers, sagger men, saw cutters, water boys, weigh men, visemen), maintenance (attendants, blacksmiths, boiler tenders, box makers, carpenters, die makers, engineers, janitors, machinists, millwrights, oilers, pattern makers, plumbers, pumpers, repairmen, sawyers, screen makers).

Glass factories

Assemblers (benchmen, bench workers), benders, blowers, carry-in-boys (utility workers), chemists (laboratory men), crack off boys, cutters, decorators (artists, painters, sprayers, stencilers, transferers), engravers, etchers (dippers), examiners, feeders (transfer men), fill men, finishers (scrappers, trimmers), furnace men (skinners, tankmen), gatherers, glaziers, grinders, laborers (helpers, job change crew, wheelers, yardmen), layers, Lehr tenders (Lehr waxers), melters, mirrors (silverers), mixers (weighers), molders (bottle makers), operators, polishers, pressers, sand blasters (blasters), sealers, setters, shippers (packers), shop boys, strippers (inspectors), supervisors (foremen, managers), truckers, unloaders, washers, other (autoclave men, brick layers, cooks, constructors, cranemen, cullet men, drawers, ladlers, liners, markers, mold makers, off bearers, pattern makers, platers, printers, rack up men, sand graders, sandmill men, seamers, set up men, wheel dressers), maintenance (blacksmiths, carpenters, electricians, engineers, firemen, machinists, mechanics, pipe fitters, plumbers, repairmen, tinnern, tin smiths, welders).

Glass mirrors

Artists (coaters), bevelers (grinders), blasters, cleaners (washmen), engravers, fitters, glaziers (apprentices, cutters, glass cutters), mirror makers, operators, packers, polishers (buffers, smoothers), pourers, silverers (platers), other (benders, chemists, designers, inspectors, laborers), maintenance (engineers, firemen, millwrights).

Lime, cement, and artificial stone

Baggers (checkers, packers, sackers), burners (clinkermen, crew men), casters (block makers, builders, concrete workers, finishers, wiremen), cement makers, chem-

ists (analysts, samplers, testers), cleaners (brushers), decorators, dippers (sprayers), dryers, feeders, grinders (blenders, crushers, millers, raw blenders, weighers), laborers (coal handlers, relief men, shovelers, utility men, yard men), material men (buggy men, dumpers), miners (blasters, drillers, sealers, shooters, tipplemen), mixers, molders, operators (conveyors, motor operators, tenders), pit men (silo men), pullers, supervisors (executives, foremen, overseers, proprietors, superintendents), track men (brake men, cagers, hook up men, motormen, mule drivers, switchmen), truck drivers, unloaders, vault builders, warehouse men (clerks, receivers, stock men, store keepers), wood workers (cabinet makers, pattern makers), other (artists, binmen, off bearers, pressmen, strippers, tunnelmen), maintenance (blacksmiths, boiler tenders, carpenters, electricians, engineers, firemen, greasers, janitors, machinists, mechanics, millwrights, oilers, painters, pipe fitters, pump tenders, repairmen, sweepers, watchmen, water softeners, welders).

Marble and stone yards

Crane men (car loaders, hookers), cutters (copers, engravers), draftsmen (markers), drillers, inspectors, laborers, operators, planers, polishers (finishers), quarry hands, sand blasters (blasters, layout men), sawyers (saw helpers), slabbers, supervisors (foremen, managers), truck drivers, other (clerks, sculptors), maintenance (blacksmiths, engineers, firemen, machinists, millwrights, tool grinders).

Potteries

Batters, bench workers, blungers (clay grinders, filter press men, mixers, operators, puggers, slip makers), carriers (mold runners, shelvees), casters, cleaners (washers), decal girls (trimmers, varnishers), decorators (artists, guilders, liners, strippers, tinters), dippers, finishers (brushers, clippers, dressers, fettlers, spongers), glaze makers (glaze mixers, mill men), glazers, grinders, hand clay workers (jar makers, sink makers), handle men (handlers, stick up men), jiggermen (clay turners), kiln operators (kiln firemen), kiln setters (kiln drawers, kiln loaders, kiln placers), laborers (handy men, loaders, unloaders, yard men), molders, mold makers (molders), operators (insulators, turners), pressmen (pressers), printers, saggermen (sagger mixers), selectors (inspectors, sorters), shippers (packers, receivers), sprayers, stock men, supervisors (foremen, managers, superintendents), technical men (ceramists, chemists), tile cutters (tubers), truckers, other (assemblers, core makers, driers, pattern makers, platers, miners), maintenance (carpenters, engineers, firemen, janitors, machinists, painters, plumbers, polishers, repairmen, tool makers, welders).

Asphalt and roofing materials

Asphalt makers, beaters, burners (drier men, furnace men), chemists (testers), cleaners (clean up men), cutters, inspectors, laborers, mixers (agitators), operators, still men (heaters), supervisors (foremen, superintendents), varnish makers (grinders, putty makers, sample makers), warehouse men (clerks), other (dust men, fillers, tar distributors), maintenance (engineers, firemen, machinists, mechanics, millwrights, oilers, watchmen, welders).

Other clay, glass, and stone

Assemblers, burners (calciners, coal wheelers), cutters, drillers, feeders, (stone pickers), finishers, glazers, inspectors (testers), kiln tenders (blowers), laborers (clean up men, yardmen), locomotive men (brakemen), mill men, miners (cagers, dumpers, loaders), mixers, molders (setters), operators, packers (bundlers, labelers), puddlers, screeners, sealers, slitters (bevelers, slit formers), shippers (stock keepers, clerks), supervisors (foremen, superintendents), other (bushers, chemists, pitmen,

samplers, truck drivers), maintenance (blacksmiths, carpenters, engineers, firemen, machinists, mechanics, millwrights, oilers, painters, repairmen, watchmen).

CLOTHING

Gloves

Cutters, dippers, driers, measurers, operators, seamstresses, shippers (clerks, packers, printers), turners, utility men, other (foremen, inspectors, pressers, quilters, winders), maintenance (firemen, janitors, machinists).

Hats and caps

Blockers, cutters, engineers, finishers (slickers), inspectors, operators, pressers (curlers, flangers), sewers (binders), shippers (packers, stock boys), sizers, supervisors (managers, superintendents), trimmers.

Shirts, collars, and cuffs

Cutters (trimmers), dyers (bleachers), markers, packers (clerks, sorters), sewers (operators), spreaders (folders), other (artists, examiners, floorladies, vulcanizers), maintenance (engineers, firemen, machinists).

Suits, coats, and overalls

Bus boys (floor girls), cementers, cleaners (brushers), collar makers (glazers), cutters (trimmers), designers (drafting men), hat makers (blockers), inspectors, jewelers (assemblers, die makers, enamellers, engravers, molders, platers, polishers, pressmen, scabbard makers), laborers (bailers), markers (layout men), pressers, printers, sewers (operators), shippers (clerks, packers, stockmen), supervisors (foreladies, foremen, superintendents), tailors (bushelmen, pinners), other (artists, dining room girl, glass workers, luggage makers, pastry makers), maintenance (engineers, firemen, janitors, machinists, porters, repairmen, tinsmiths).

Women's light clothing

Bundlers, cleaners (finishers, spotters, washers), cutters (trimmers), designers (pattern makers), dyers, examiners, knitters, loopers, markers, operators, pressers, set up men, sewers, spinners, spreaders (folders, layers, pilers), stock keepers (clerks), supervisors (foreladies, foremen, managers), other (artists, laborers, pickers, stampers), maintenance (mechanics, porters, repairmen).

Fur goods

Cleaners, clerks, cutters, designers, finishers, floor boys, floor ladies, fur matchers, furriers, glazers, joiners, liners, managers, nailers, operators, repairmen, sewers, squarers, storers, tailors.

Other clothing

Cutters, mechanics, operators, padders, shippers (packers, clerks, stencilers, stock keepers), other (painters, shapers).

FOOD AND ALLIED INDUSTRIES

Bakeries

Bakers, bench men, cake makers (pastry men), chefs (fryers), dividers (dough slitters), icers (coaters, finishers), fillers, greasers (pan men), laborers (utility men), make up men (fabricators), mixers (batchmen, blenders), molders, operators, oven men, packers (wrappers), peelers, salesmen (clerks, sandwich girls, store keepers, waitresses), scalers (weighers), sealers, supervisors (department heads, executive, floormen, foremen, superintendents), truck drivers (truck loaders), washers

(clean up men, porters), other (chemists, crumb makers, printers, receivers), maintenance (carpenters, electricians, engineers, firemen, janitors, machinists, mechanics, oilers, painters, pipe fitters, repairmen, watchmen).

Dairy products

Bottlers (fillers), bench workers, butter makers, cheese makers, clerks (cash chargers, checkers), dairymen, ice cream makers (coaters), laborers (utility men), milk handlers (dumpers, receivers, swing men, truck drivers), mixers, operators, pasteurizers, supervisors (executives, foremen), technical men (samplers, technicians, testers), washers (cleaners, feeders), weighers, wrappers (packers), other (butchers, cooks), maintenance blacksmiths, carpenters, engineers, firemen, greasers, horse shoers, mechanics, millwrights, painters, porters, service men, stable men).

Candy

Bottlers, candy makers, cleaners, cooks, decorators, dippers (coaters), distributors (runners, truckers), fillers, laborers, mixers, (batchmen), molders (pourers), operators, packers (wrappers), roasters, rollers, roughers (finishers), supervisors (foremen), table men, weighers, other (blanchers, chemists, printers, sorters), maintenance (box makers, engineers, firemen, grinders, janitors, machinists).

Flour and grain

Baggers, bag handlers (dumpers, feeders), cleaners (blowers), drivers (haulers), driers, fillers (beltmen, cappers), laborers, millers (elevator men, grinders), mixers (blenders), operators, printers (compositors), scale girls (checkers), shippers (clerks, loaders, packers, receivers, storage men, warehouse men), supervisors (foremen, managers), other (artists, chemists, salesmen, tube makers), maintenance (engineers, electricians, firemen, machinists, mechanics, oilers, painters, pipe fitters, repairmen, sweepers, tanners).

Slaughter and packing houses

Benchmen, boners, butchers, casing men, cooks, cooler men, curers, cutters (chippers, twisters, slicers, splitters, trimmers), grinders (mixers, millers), laborers (lifters, utility men, yardmen), operators, packers, processors (picklers, salters), renderers (lard men, tank men), sausage makers (linkers, stuffers), shippers, skinners, slaughterers, smokers, supervisors (bookkeepers, checkers, executives, foremen, inspectors), truck drivers, warehouse men (clerks, provision men, salesmen), washers (attendants), other (bakers, coopers, hidemen, pressers, singers, testers), maintenance (boiler men, engineers, firemen, laundrymen, mechanics).

Ice manufacture

Bottlers, engineers, foremen, ice makers, ice pullers, laborers, mixers (crushers), operators, storage men, truck drivers, maintenance (blacksmiths, carpenters, coal men, mechanics, painters).

Liquor, beer, and wine

Agers, bottlers (carbonizers, fillers), brew masters, cellar men (rackers), chemists, compounders, cutters, fermenters, finishers, kettle men (beer makers, yeastmen), laborers (yardmen), loaders (packers), millers (mill men), operators (distillers, still operators), pitchers, storage men, supervisors (foremen, superintendent), utility men, washers (cleaners, feeders), other (clerks, filterers, ice makers, inspectors, weighers), maintenance (carpenters, electricians, engineers, firemen, grinders, mechanics, oilers, painters, plumbers, pipe fitters, porters, repairmen, tank liners).

Soft beverages

Bottlers (fillers), laborers, mixers (chemists, extract men), shippers (carton makers, labelers, packers, pasters), soakers, supervisors (foremen, managers).

washers, maintenance (carpenters, firemen, machinists, painters).

Other foods

Bakers, bottlers, candy makers, chemists, cooks (meatball makers), compounders, cutters, feeders (dumpers), fillers (stuffers), grinders (millers), inspectors, laborers, loaders, mixers (blenders), operators, packers (sealers, set-up men, wrappers), printers (pressmen), processors (bleachers, churners, mustard makers, pasteurizers), refiners, roasters, scalers (weighers), shippers (clerks, pasters, stock keepers, truckers), sorters (graders), sprayers, supervisors (foremen, managers, superintendents), washers (cleaners), other (catchers, chipmen, crushers, driers), maintenance (carpenters, coopers, electricians, engineers, firemen, mechanics, millwrights, oilers, painters, porters, welders).

IRON AND STEEL

Agricultural implements

Assemblers, core makers (core pasters), electricians, foremen, forgers (blacksmiths, hammermen, heaters, temperers), furnace tenders (oven tenders), grinders (polishers), laborers, machinists (tool and die makers), molders, operators, painters, pattern makers, pourers, sand blasters, trimmers, welders, wood workers, other (inspectors, labelers, setters), maintenance (mechanics, repairmen).

Automobile factories

Assemblers (vise workers), banders, body builders (metal workers), carpenters (wood workers), cementers (insulation men), chippers, core makers, cupola tenders (furnace tenders), driers, electricians, engineers, forgers (blacksmiths, hammer men, roller men, straighteners), grinders (finishers, sanders), heat treaters (annealers, hardeners, heaters), inspectors, laborers (loaders, mill hands, steel handlers), machinists (tool and die makers), molders, operators, painters (sprayers), pattern makers, picklers (cleaners, unloaders), platers, polishers (rubbers), pressmen (blankers, stampers), riveters, sand blasters, shippers (clerks, stock room men), solderers, spark plug builders, supervisors (foremen, managers), technical men (chemists, experimental men, testers), upholsterers (cloth layers, cutters, sewers, trimmers), washers, welders (burners), other (adjusters, brush reliners, cooks, gas house men, kitchen workers, mixers, printers, spring makers, winders), maintenance (boiler men, coal crushers, firemen, janitors, mechanics, millwrights, oilers, pipe fitters, porters, repairmen, watchmen).

Blast furnaces and steel rolling mills

Annealers (normalizers, temperers), Bessemer men, blockers, boiler makers, bottom makers (brick layers), brass men, catchers, chippers, cleaners (washers, wipers), core makers, crane men, cupola chargers, doublers, draw men (observers), feeders, furnace tappers, furnace tenders (melters, stove tenders), galvanizers, gin men, grinders (emery wheel men, sanders), heater men, hot enders, inspectors (checkers), keepers, laborers (crew men, floor men, plant men, section hands, shovelers, spell men, utility men), ladle men (pourers), loaders, machinists (reamers, tool and die makers), mill hands, mixers, molders, open hearth men, operators, other steel workers (benders, builders, bundlers, burners, finishers, gaugers, hookers, hot workmen, manipulators, metal workers, off bearers, pit men, riggers, scarfers, set up men, shreaders, slitters, stackers, tapering men, tippers, tong men, trimmers), picklers (acid men, pack up men), pressmen, pump men, reelers, riggers, rollers, roughers, rulers, shake out men, shear men (saw men), shippers (clerks, packers, stencilers, stockmen), straighteners, supervisors (foremen, superintendents), switchers, technical men (analysts,

chemists, metallurgists, samplers, testers), truck drivers (motor men, tractor drivers, transfer men), winders (spoolers), other (balers, box makers, cinder snappers, closers, conveyors, crushers, disbursers, driers, dumpers, etchers, extractors, flask men, hoisters, levelers, lid men, lime men, liquor makers, locomotive men, luters, oven tenders, pattern makers, platers, pokers, printers, producers, pushers, reelers, regenerator men, rulers, saturator men, screen men, skid makers, slate shooters, sorters, still men, stranders, tracers, trestle men, trough men, tumblers, water tenders, weighers, wheelers), maintenance (ash removers, battery men, blacksmiths, carpenters, electricians, engineers, firemen, gas men, greasemen, janitors, lathe men, mechanics, millwrights, oilers, painters, pipe fitters, repairmen, sharpeners, stone masons, telephone men, tinnners, welders).

Car and railroad shops

Bench workers, blacksmiths (forgers), boiler makers, carpenters (wood workers), core makers, engineers, erectors, furnace men (chargers, firemen), heat treaters, laborers, machinists (tool makers), molders, painters, pattern makers, repairmen, riveters, sand blasters, steel workers, washers, welders, cutters.

Ship and boat building

Electricians, engineers, insulators, machinists, painters, pipe fitters, punch men, riveters, sand blasters (blasters), tinnners, welders (torch men), wood workers (joiners).

Foundries

Assemblers (bench workers), chargers (cupola chargers, loaders), chippers, cleaners (rattle men), core makers (core checkers), crane men, cupola tenders (furnace tenders, melters), cutters (gear cutters), drillers (sawyers), erectors (fabricating men), forgers (bolt headers, hammer men), galvanizers (tinnners), grinders, heat treaters (annealers, hardeners), inspectors (testers), laborers (gang way men, handy men, weight shifter, yard men), machinists, millwrights, mixers, molders (sand slingers), operators (attendants), oven tenders (oven men), painters, pattern makers (apprentices), picklers (dippers), platers, pourers (dry floor closures, ladle men, pour off men), receivers, sand blasters, shake out men (dumpers, handlers), sheet metal workers (lay out men), shippers (clerks, packers, storage men), sorters, supervisors (foremen), technical men (blue printers, chemists, metallurgists, nurses, physicians, research engineers, tracers), tool makers, welders (burners), other (chain makers, cooks, finishers, flask men, hangers, metalizers, polishers, stock men, switch men, taperers, weighers), maintenance (blacksmiths, engineers, firemen, janitors, oilers, patchers, pipe fitters, plasterers, plumbers, porters, repair men, technicians, tinsmiths, watchmen).

Welding, forging and heat treating

Assemblers (bench assemblers, bench hands, bench men, boiler makers, fabricators, insulators, lay out men, steel fabricators, steel men, stone makers), apprentices, casters (adjusters, die casters, die setters, die sinkers, molders, mold men, setters, set up men), chippers, cleaners (sanders and cleaners, tumblers, washers, wipers), crane men (truck drivers, truckers), cutters (saw men, sawyers, shearers), filers, finishers, forgers (blacksmiths, bulldozers, chain makers, drop forgers, hammer men, upsetters), furnace tenders (ash men, bakers, cupola chargers, cupola tenders, furnace operators, hearth men, heaters, melters, rivet heaters, runners, tenders, vitreous enamellers), grinders (die grinder operators, edgers, emery wheel men, roughers, sanders, sharpeners), heat treaters (annealers, case hardeners, hardening men, hardeners, normalizers, metal hardeners, steel treaters, stiffeners, tempering

smiths, temperers), inspectors (testers), laborers (catchers, handy men), loaders (car loaders, machinists (bit men, drillers, iron workers, lathe hands, shapers, tool and die makers, tool drawers, tool dressers, turret lathe men), millworkers (mill hands, mill men, rollers, roll turners, runners, turners), millwrights, operators (beaders, broachers, flangers, hand screw men, instrument makers, screw makers, weavers), painters (dippers, fillers, grainers, seamers, sprayers, spray operators), pattern makers, picklers (acid men, acid treaters, dippers), pit men (pit shoveler), platers (electroplaters, galvanizers, nicklers, nickel platers), polishers (brushers, buffers, wheel setters), pressmen (press hands), riveters, sand blasters (abrasive men, blast-ers), sheet metal men (benders, metal benders, metal workers, sheet metal handlers, sheet metal workers, tanners, tinsmiths), shippers (clerks, packers), solderers (torch solderers), stock men (die stock clerks, stockers, stock room keepers), supervisors (control men, foremen, superintendents, managers, floor men), technical men (blue printers, chemists, draftsmen, experimental men, testers), tool and die makers, trimmers, welders (brazers, burners), winders (winders and cutters), wood workers, maintenance (blacksmiths, bottom makers, electricians, engineers, firemen, fitters, mechanics, oilers, pipe fitters, pipe workers, plumbers, porters, repairmen, stokers, sweepers, utility men, watchmen), other (bluers, bottlers, case makers, coil makers, cooks, core makers, croppers, drawers, driers, dry tumblers, die drawers, etchers, furnace installers, ink makers, instrument makers, insulators, loom makers, mixers, paraffin coaters, pasters, printers, saw makers, scale makers, scrap men, screen workers, spring makers, taperers, transfer men, weighers, wiremen).

Machine shops

Assemblers (bench workers, lay out men, wing assemblers), cleaners (tumblers, washers), cutters, extractors (reclaim men, separators), finishers, furnace men (hard-eners, oven tenders), grinders, inspectors, laborers, machinists (drillers, gear cutters), operators (sand blasters, stampers), painters (dippers, sprayers), picklers, platers, polishers (buffers), repairmen, sheet metal workers (metal workers, tinners), shippers (box makers, clerks, craters, packers, stock room men), supervisors (foremen, superintendents), tool and die makers, upholsterers, wood workers (carpenters, mill hands, mill room workers, pattern makers), other (draftsmen, glass men, frame makers, mill room workers, mixers, rib builders, roofers, screen makers, spring makers, technicians, truck drivers, wire drawers), maintenance (blacksmiths, brazers, electricians, engineers, firemen, handymen, mechanics, millwrights, oilers, repairmen, sweepers, watchmen, welders).

METAL INDUSTRIES (Except Iron and Steel)

Brass factories

Assemblers (bench hands, set up men), cleaners (cleaning men, metal cleaners, rattlers, tumblers, washers, chippers), core makers (core pasters, core scrapers), cupola tenders (furnace men, furnace tenders, melters, smelters, chargers), grinders, inspectors (checkers), laborers (foundry laborers, handymen), machinists (lathe hands, millwrights, reamers, setters, tool and die makers, tool makers, toppers), mixers, molders, operators (cutters), oven tenders (oven men, heat treaters), painters, pattern makers, platers (chrome platers, dippers, dryers, galvanizers, rinsers), polishers (buffers, finishers), pourers (metal carriers, metal pourers, pour off men, die casters), sand blasters (blast-ers), shake out men (cut off men, wire pullers), shippers (packers, wrappers), sheet metal workers (tanners, cutters), supervisors (control men, executives, foremen, managers, superintendents), technical men (blue

printers, chemists, draftsmen, drivers, filers, metallurgists, photographers, testers), welders, other (cooks, cover sealers, first aid men, lead coaters, metal coverers, picklers, sand screeners, solderers, crane men), maintenance (blacksmiths, carpenters, electricians, engineers, firemen, mechanics, plumbers, repairmen, utility men, watchmen).

Clock and watch factories

Buffers (finishers, grinders), cleaners, cutters, machinists, operators, painters, platers, pressmen, repairmen, wood workers (cabinet makers), other (blasters, foremen, melters, reclaimers, rollers, temperers).

Copper factories

Annealers (heater men, heat treaters), assemblers, cooper smiths, furnace tenders (melters), machinists, metal workers, operators, picklers (metal cleaners), polishers, rollers, tinnners, welders, other (box makers, laborers, packers), maintenance (blacksmiths, engineers, firemen, handymen, mechanics, oilers, repairmen).

Jewelry

Benchmen, casters, diamond cutters, dyers, enamellers, engravers, (stripers), jewelers (apprentices), manufacturers, messengers, polishers, stampers, stone setters, superintendents, tool and die makers, watch makers, other (melters, operators, platers).

Lead and zinc

Chemists, drivers, foremen, furnace tenders, laborers, molders, operators, pressmen, shippers (clerks, packers, warehouse men), wheel dressers, winders).

Tin and enamelware

Assemblers (lay out men), baggers, beadrs, brushers (scratch brush men), burners, cleaners (nickel scrubbers, washers), dippers, enamel makers, enamellers (final wrigglers, lay girls, mudders, patchers, stencil girls), foundry workers, furnace tenders (bakers, loaders, oven girls, oven men), galvanizers, grinders (frame makers, stoners), laborers, machinists (tool makers), metal workers, mixers, operators, painters, picklers (boil off men), platers (chrome platers, nickel platers, chrome rackers), polishers (buffers, flex polishers, pumicers), pressmen (shear men), rimmers, sand blasters, shippers (clerks, packers), smelters, solderers (stud setters), sprayers, stripers (wipers), supervisors (foremen, time study men, inspectors), technical men (blue printers, chemists), tinnners, welders, other (cranemen, pick up men, salvagers, sorters), maintenance (carpenters, firemen, janitors, millwrights, oilers, pipe fitters, watchmen).

Aluminum products

Buffers (brushers, finishers, polishers), cleaners (dippers, washers), core makers, cutters, die casters, furnace tenders (alloy men, melters), grinders, hammer men, heat treaters, inspectors, laborers, machinists (die makers), molders (foundry workers), operators, painters (skimmers), pattern makers, reclaimers, shippers (clerks, labelers), spinners, supervisors (foremen, superintendents), technicians (chemists), trimmers, welders, other (cooks, wheel setters), maintenance (firemen, mechanics, millwrights, watchmen).

Electroplating

Foremen, grinders, laborers, packers (clerks), platers, polishers (buffers), sprayers (dippers), tinnners, tumblers (dryers), washers, other (chemists, oven tenders, wheel men), maintenance (engineers, firemen).

Other

Assemblers (bench men, drillers, fitters), carpenters, casters, cleaners (dippers), foundry workers (chippers, coremakers, pourers, molders, sand blasters), furnace men, grinders (metal filers), heat treaters (forgers), laborers, machinists (die makers, tool makers), metal workers, operators, painters, pattern makers, platers, polishers (buffers), pressmen (shearers), shippers (packers), solderers, spinners, supervisors (foremen), technical men (chemists, research workers), welders, other (bundlers, enamellers, engravers, fillers, sorters), maintenance (engineers, firemen, mechanics, repairmen).

LEATHER**Leather belt and goods**

Assemblers, creasers, curriers (finishers, polishers), cutters (skivers, trimmers), embossers (designers), gluers, harness makers (collar makers), inspectors, pad makers, painters, pressers, operators, sewers (case makers, cone makers, pocket-book makers), shippers (receivers, sorters, stockmen), other (edgers, planers, setters, scourers, stretchers, treaters), maintenance (engineers, firemen, janitors, mechanics, millwrights).

Shoes

Assemblers, brushers, buffers, builders, burnishers, cementers (gluers, table workers), cleaners, coverers, cutters, dippers, dispatchers, dressers, fillers, finishers, fitters (heel fitters), folders, heelers (breasters, heel cuppers), inkers (stripers), inspectors, lasters (last pullers), layers, liners, markers, molders, operators, painters, pasters, polishers (slickers), reducers, repairmen, roughers (grinders), rounders, sanders, setters, shippers (clerks), singers, skivers, sprayers, stainers, stitchers, treers, trimmers, other (bleachers, bottomers, channelers, corders, crushers, driers, embossers, eyelet stayers, foremen, formers, laborers, pullers, rollers, rubbers, scrapers, shank placers, softeners, sorters, splitters, spoolers, stampers, stiffeners, testers, treaters, truers, wheelers), maintenance (carpenters, electricians, engineers, firemen, janitors, machinists, mechanics).

Tanneries

Bleachers, buffers (burnishers), embossers (grainers), grinders (mixers), laborers (yardmen), oilers (stuffers, wipers), operators, pasters (glazers, swabbers), scudders (shavers, unhairers), setters (ironers, jackers, resetters, rollers), shippers (stockers, stockmen), smutters (painters), soakers (pitmen, tumblers, vatmen), splitters, tackers (strippers), tanners (dippers, wringers), trimmers, washers, other (blockers, leachers, patchers, sorters, togglers), maintenance (engineers, firemen, millwrights).

Trunks and suitcases

Box makers, cutters, finishers, gluers, liners, luggage makers, markers, mounters, operators, painters, pattern makers, repairmen, sewers, maintenance (firemen, mechanics, watchmen).

LUMBER AND FURNITURE**Wood, wicker, and upholstered furniture**

Assemblers (bench men), cabinet makers (frame makers), carvers, cutters (sawyers), decorators (stainers, stampers), fillers, finishers, metal workers (benders), millworkers, operators, other wood workers (joiners, planers, shapers, wood workers), painters (dippers, sprayers), repairmen, sanders, shippers (clerks, wrappers),

springers (spring makers), supervisors (foremen, superintendent), trimmers, upholsterers (carpet layers, cushion makers, sewers), welders, other (cooks, designers, gluers, laborers, sample men, set up men), maintenance (electricians, engineers, firemen, janitors, mechanics, watchmen).

Metal furniture

Assemblers (builders), buffers (polishers), core makers, cutters, finishers (rubbers, surfacers), forgers (heat treaters), grinders, laborers, machinists (tool and die makers), mixers, molders, operators, painters (dippers, grainers, sprayers), platers, pressmen, printers, sanders (blasters), shippers (clerks, craters, stencil makers), sheet metal workers (benders), supervisors (foremen), upholsterers (coverers, seamstresses, trimmers), washers (cleaners), welders, wood workers (carpenters, off bearers, pattern makers), other (binders, chemists, chippers, driers, etchers, filers, fillers, formers, glazers, gluers, joiners, mounters, oven tenders), maintenance (engineers, firemen, millwrights, oilers, plumbers, porters, tinnners).

Other furniture

Assemblers, cabinet makers, glaziers, laborers, machinists, metal workers (tin-smiths), operators, painters (finishers, sprayers), polishers (sanders), shippers (clerks, packers), supervisors (foremen, managers), upholsterers (sewers), welders, wood workers (cutters, joiners, mill workers), other (cleaners, detailers, oven tenders, rubbers, truck drivers), maintenance (engineers, firemen, janitors, millwrights).

Planing and milling

Bench men (assemblers), box makers, cabinet makers (sash makers), carpenters, coopers, foremen, glaziers, laborers, machine men (drillers), mill men (machine hands, planers), nailers, operators, printers, sawyers (cutters), shippers (clerks, labelers), truckers, wood workers (pattern makers), other (cleaners, coverers, finishers, glue men, matchers, rippers, sanders, shade makers, tail off men), maintenance (engineers, firemen, janitors, painters, plumbers, shop men, tinnners, welders).

Other woodworking

Assemblers (installers, set up men), cabinet makers (wind chest makers), coopers (belly men, charrers, crozers, headers), coverers, finishers (rubbers), forgers (heaters), graders (sorters), grinders (polishers), inspectors, laborers (lumber men), operators, organ men (tuners), other woodworkers (blockers, concavers, carvers, carpenters, groovers, joiners, lathe men, lobers, planers, rounders, woodworkers), painters (dippers, setters, stainers), pattern makers, pressmen, regulators, sanders, saw men (cutters), shippers (clerks, packers), supervisors (foremen, managers), veneer men, wax workers, other (cobblers, cooks, drawers, filers, gluers, inspectors, molders, nailers, platers, printers, pullers, riveters, scrapers, sewers, shapers, skimmers, stretchers), maintenance (engineers, firemen, flushers, janitors, mechanics, millwrights, oilers, tinnners, welders).

PAPER, PRINTING, AND ALLIED INDUSTRIES

Blank books and paper products

Chemists, coaters (grinders), cutters (slitters, trimmers), foremen, laborers (utility men), machine tenders (end tenders, machine feeders), mixers (glue mixers), operators, printers (pressmen, stereotypers, typesetters), rewinders (reel men), rollers, shippers (packers, receivers), sorters (graders), waxers, other (artists, calender men, cooks, counters, embossers, engravers, folders, inkers, ink makers, loaders, nailers, paste makers, pasters, pattern finishers, platers, sample men, sheeters), main-

tenance (electricians, engineers, firemen, machinists, mechanics, painters, repairmen, watchmen).

Paper and pulp mills

Beater engineers (beater helpers), box makers, chemists, foremen, heaters, hookers, laborers (paper boys), machine feeders, mixers, operators (batch tenders, machine tenders), paper makers (paper mill operators), printers (pressmen, rule men), rotary men, shippers (balers, clerks, fillers, packers, stock men), sorters, truckers, other (embossers, gluers, knife men, labelers, lime men), maintenance (carpenters, coal handlers, electricians, engineers, firemen, machinists, mechanics, mill wrights, oilers, repairmen, watchmen).

Paper box factories

Assemblers (stayers), box makers (folders), coaters, corrugation men, covers, cutters (band sawyers, scorers, slitters), die makers, feeders, foremen, heaters, inspectors, operators, pasters (gluers, tapers), printers (compositors, pressmen, type-setters), shippers (balers, bundlers, clerks, labelers, stencilers, wrappers), strippers, winders, other (chemists, finishers, liners, laborers, mixers, tappers, truckers, vulcanizers, maintenance (boiler room men, carpenters, engineers, firemen, janitors, machinists, mechanics, painters, plumbers, scrap men)).

Engraving and photographic work

Artists, assemblers (bench workers), battery men, cutters, developers (errand boys, lithographers, washers), engravers, etchers, finishers, floor walkers, operators, photographers, photo workers (blue printers), platers, printers (compositors, feeders, pressmen, set-up men, type setters), proofers, routers, shippers (binders, case fillers, clerks, packers), supervisors (foremen, superintendents), wax casters (molders), other (designers, embossers, grinders, metal workers, sprayers, stenographers, testers, transfer men), maintenance (janitors, machinists, mechanics, painters, porters).

Printing and publishing

Assemblers (bench men), binders, case makers, cleaners (bucket washers, dippers, removers), compositors, cutters, electrotypers (electrotype finishers), engravers, fly boys, folders, heat treaters, ink mixers, laborers (ink handlers, paper handlers, utility workers), linotype operators, make up men (lock up men), melters (metal men, smelters), operators, oxidizers, painters (artists, sprayers, tinters), photographers, photo lithographers (lithographers), platers, plate molders (casters, mat makers), polishers (grinders), pressmen (feeders), printers, proofers, shippers (clerks, packers, stock men, wrappers), stereotypers (monotype operators), supervisors (foremen, presidents), technical men (chemists, developers, negative retouchers), tool and die makers, type setters, washers, other (bakers, cooks, dump boys, oven tenders, pattern makers, planers, rulers, sealers, stampers, steel type makers, transfer men), maintenance (ash men, carpenters, firemen, janitors, machinists, mechanics, plumbers, repairmen, welders).

TEXTILE

Cotton goods

Bleachers, calender men, cutters, dyers (dye men), inspectors (proofers), mill men (mixers), operators, printers, set-up men, shippers (balers, packers, stockmen), weavers, winders (spoolers), other (cement mixers, chippers, driers, folders, foremen, handy men, laborers, sorters, splitters, turners, type setters, varnish men), maintenance (engineer, firemen, machinists, millwrights, porter, repairmen, watchmen).

Knit goods

Adjusters, cutters, dyers, finishers, knitters, laborers, markers, operators, rippers, shippers, supervisors (foremen, superintendent), weavers, winders, maintenance (machinists).

Textile dyeing and finishing

Brushers, chemists (druggists), coaters, color matchers, cutters, examiners, kettle men (dyers), laborers, mixers, nappers, operators, painters, rain proofers, shearers (balers), Spanishers, supervisors (foremen), washers, winders, other (dryers, finishers, grinders, soap makers, truckers), maintenance (ash handlers, carpenters, electricians, engineers, firemen, janitors, machinists, millwrights, oilers, pipe fitters, welders).

Woolen and worsted

Carbonizers, carders, dryers, dusters, dyers, finishers, floor men, inspectors (graders), laborers, mixers, operators, pickers, sorters, spinners, strippers, supervisors (foremen, superintendents), trackmen, truckers, vat men, washers (cleaners), other (attendants, bailers, cutters, extractors, knitters), maintenance (blacksmiths, carpenters, electricians, engineers, firemen, machinists, millwrights, oilers, oil men, painters, pipe fitters, repairmen, tinsmiths, watchmen, welders).

Embroideries and laces

Bobbin makers, cleaners, cutters, dyers, operators, strippers, winders.

Tents and awnings

Assemblers, cleaners, cutters (sawyers), examiners, foreladies, frame makers, laborers, lay out men, operators, painters (screen men, sprayers), pressmen, router, sewers, shippers (clerks, packers, stock men).

Mattresses and bedding

Assemblers (spring makers), cutters, finishers, operators, oven men (bakers, burners, sterilizers), pickers, renovators (cleaners), rollers, seamstresses (sewers, stitchers), shippers (balers, clerks, wrappers), supervisors (foremen, superintendents), tick makers (fillers, tufters), upholsterers (cover men), other (beaters, feeders, inspectors, laborers, salesman, temperers, truckers, webbers, weighers, woodworkers), maintenance (carpenters, firemen, janitors, mechanics, painters).

Other textiles

Cleaners (washers), coaters, compounders, cookers, cutters (chippers, tippers, trimmers), dyers, grainers, grinders, inspectors, laborers, mixers, operators, other clothworkers (batters, closers, combers, enders, folders, menders, openers, shade makers, tufters, turners), pickers, pounders, printers, pullers (preparers, spreaders), rollers, sewers (quilters, tailors), shippers (balers, clerks, packers, warehouse men), sorters, stuffers, supervisors (foremen, superintendent), other (assemblers, cabinet makers, chemists, enamelers, fillers, pattern makers, truckers), maintenance (carpenters, engineers, firemen, janitors, mechanics, millwrights, tinnners).

RUBBER**Rubber tires**

Assemblers, baggers, balancers, bead makers, buffers, builders, cementers, cleaners (washers), compounders, curing men, cutters, finishers, grinders, heaters, inspectors, laborers (utility men, yard men), liners, machinists, mill men (rollers), mixers, operators (attendants), pattern makers, preparers, pressmen, printers (compositors, stampers), production men, sand blasters, scrap men, shippers (binders,

checkers, clerks, packers, receivers, stock men, storage men, wrappers), splicers, spreaders, supervisors (foremen), technical men (chemists, experimental men), truckers, weighers, other (air bag builders, builders, burners, cooks, coverers, dippers, driers, dusters, fillers, inflaters, insulators, melters, molders, platers, sealers, setters, soapers, sorters, stainers, stamper, strippers, tank men, templet makers, tread removers, treaters, tube formers, vulcanizers, weavers, wheelers), maintenance (ash men, blacksmiths, carpenters, coal passers, electricians, engineers, firemen, janitors, masons, mechanics, oilers, painters, pipe fitters, plumbers, repairmen, sprayers, timbers, welders, watchmen).

Other rubber factories

Assemblers (bench men), buffers (polishers), compounders, coverers, curing men, cutters, decorators (markers, sprayers), developers, dippers, engravers, fillers, finishers, forming girls, grinders, inspectors, laborers, machinists (tool and die makers), mill men (calender men), mixers (weighers), molders, operators (attendants), platers, pressmen, printers (compositors, type setters), refiners, rollers, shippers (clerks, packers, receivers, storehouse helpers), stampers, stamp makers, strippers, supervisors (foremen), technical men (chemists, experimental men, testers), trimmers, truckers (haulers), vulcanizers, washers (cleaners), other (acid men, applicators, bakers, braider men, burners, cementers, cement makers, chippers, eye makers, driers, facers, gummers, heaters, melters, modelers, mounters, nailers, pattern makers, preparers, rubber men, scrap men, shrinkers, soakers, soap stoners, sorters, splicers, spoolers, tumblers, warm up men, weavers, welders), maintenance (carpenters, dusters, engineers, firemen, mechanics, painters, repairmen, sweepers).

MISCELLANEOUS MANUFACTURING INDUSTRIES

Brooms and brushes

Bleachers, branders, broom and brush makers, cutters, finishers, inspectors, laborers, operators, painters (dippers, dyers), sanders, scrapers (combers), sewers (stitchers), sorters, trimmers, other (blockers, buffers, foremen, mixers, nailers, shapers, staplers, woodworkers), maintenance (engineers, janitors, machinists, mechanics).

Electrical machinery

Assemblers (bench workers, builders), casters, chargers (gas chargers), cleaners (washers, wipers), cutters (shear men), electricians, finishers, foundry workers (blasters, core makers, molders, pourers), furnace tenders (heaters, smelters), grinders, handlers, heat treaters, inspectors, insulators, laborers (utility men), machinists (tool and die makers), metal workers, mixers, operators (attendants, mill men), oven tenders (bakers), painters (dippers, sprayers), pattern makers (cabinet makers, woodworkers), picklers (acid men), platers (galvanizers), polishers (rubber, brushes, buffers), pressmen, repairmen, sanders, setters, sharpeners (honors), shippers (box makers, clerks, packers, stock men), solderers, supervisors (foremen, superintendents), technical men (blue printers, chemists, experimental men, metallurgists, technicians, testers), trimmers, truck drivers, welders (brazers), winders, other (advertising men, artists, assorters, banders, batchmen, battery men, blowers, bottlers, burners, burnishers, caulkers, chiefs, coaters, commutators, cut out men, degreasers, distillers, drillers, enamelers, etchers, eyeletters, floor girls, formers, gas makers, impregnators, knock out men, leather workers, letterers, loaders, mixers, model men, oxidizers, preparation men, processors, pumpers, reclaimers, riveters, sealers, separators, setters, set up men, sign makers, slitters, spinners, stripers, tanners, tappers,

varnishers, waxers, weighers), maintenance (blacksmiths, carpenters, engineers, firemen, grease men, janitors, laundry men, masons, mechanics, millwrights, patrolmen, oilers, pipe fitters, plasterers, plumbers, tinnners, watchmen).

Instruments

Assemblers, bench workers (bench men), electricians, glass blowers, heat treaters, machinists (tool and die makers), operators, painters, printers (press feeders, type setters), sealers, supervisors (foremen, superintendent), technicians (dental technicians), woodworkers, other (clerks, laborers, pattern makers, polishers, sawyers, scratchers, sheet metal workers, thermometer fillers).

Gas and electrical fixtures

Assemblers (bench hands), basers, carpenters, cleaners, coil benders, designers (artists), electroplaters, furnace operators, heat treaters (annealers, tool hardeners), inserters, laborers (handy men), machinists (tool and die makers), operators, painters (dippers, finishers, sprayers, strippers), picklers, polishers (buffers, sanders), sealers, shippers (clerks, packers, stockmen), solderers, spinners, welders (brazers), other (beaders, cutters, foremen, frosters, markers, molders, oxidizers, printers, testers, trimmers), maintenance (engineers, firemen, machinists, millwrights, plumbers, repairmen, watchmen).

Storage batteries

Annealers (generator men), assemblers, burners, casters (molders, pourers), connectors, feeders, furnace tenders, grinders, inspectors, laborers, mixers, operators, painters (sprayers), pasters (paste makers), platers (zinc coaters), polishers, separators, shippers (clerks, fillers, packers, sealers, stockmen, supply men, wrappers), solderers, stampers, supervisors (foremen), take off men, technical men (checkers, chemists, laboratory assistants, testers), truckers (drivers), other (battery chargers, battery men, bin room attendants, blockers, cleaners, celler men, compounders, cooks, coverers, detailers, dippers, drawers, floor men, loaders, pattern makers, planers, radio men, rebuilders, refiners, spinners, strappers, tampers, treaters, washers, wheelers), maintenance (blacksmiths, electricians, engineers, firemen, janitors, lathe hands, lubrication men, machinists, mechanics, oilers, pipe fitters, repairmen, safety men, service men, tinnners, tool and die makers, welders).

Dental supplies

Bench workers, ceramists, dentists, errand boys, finishers, foremen, gold men, machinists, plaster men, set up men, technicians (chemists, laboratory workers).

Optical goods

Assemblers (bench men), blockers, cementers, cutters, delivery men, drillers, edgers, foremen, graders, grinders and polishers (buffers, roughers), operators, opticians, porters.

Signs (non-electrical)

Applicators, artists (letterers), assemblers, belt men, bill pasters, carpenters (cabinet makers, woodworkers), cutters, engravers, furnace men, operators, painters, polishers (brushers, finishers, roughers), printers (type setters), shapers, sheet metal workers, shippers (clerks, packers), sign makers (sign writers), other (bevelers, binders, coaters, etchers, mixers, pumpers, sample makers, sand blasters, washers), maintenance (engineers, service men).

Toys and unclassified novelties

Assemblers (bench men), cupola tenders, driers, fillers, finishers, grinders, inspectors, laborers (handy men), machinists (tool makers), molders, operators, paint-

ers (artists, decorators, dippers, sprayers), pasters (mixers, stampers), rollers, sanders, shippers (clerks, labelers), woodworkers (pattern makers), other (chemists, cleaners, foremen, markers, millmen, nailers, platers, pressers, printers, riveters, welders), maintenance (carpenters, engineers, firemen, repairmen).

Other manufacturing plants

Annealers (hardeners), artists, assemblers (bench men), case makers (box makers), cutters (sawyers), engravers, fillers, finishers, fly boys, grinders (sharpeners), laborers, leaders, machinists (tool makers), millmen, mixers, molders, mounters, operators, painters (blenders, dippers, screen men, sprayers), pen makers, platers, polishers, presses, pressmen, printers (stampers), roller makers, sanders, shippers (clerks, labelers, stock keepers), solderers, stringers, supervisors (foremen), tiers, transfer men (feeders), welders (brazers), wood workers (cabinet makers), other (balancers, blasters, blockers, checkers, chemists, cleaners, coilers, coverers, drillers, dusters, dyers, experimental men, fitters, graders, hammer men, heaters, hook makers, ink makers, melters, parts men, pasters, picklers, powder makers, ribbers, riggers, sewers, sifters, sorters, stamp makers, trimmers, tumblers, turners, weighers), maintenance (blacksmiths, carpenters, engineers, firemen, mechanics, repairmen, watchmen).



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